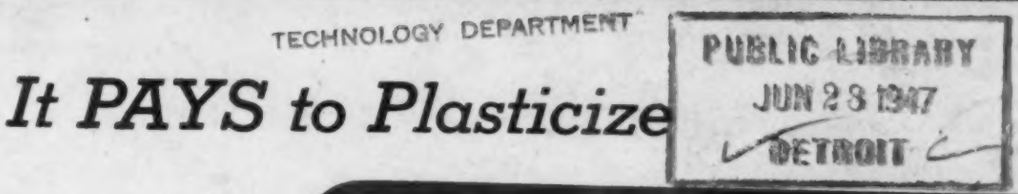
The RUBBER AGE

June, 1947

TECHNOLOGY DEPARTMENT



It PAYS to Plasticize

BONDOGEN

REOGEN

PLASTOGEN

Reduce Milling Time
Reduce Scorch
Reduce Shrinkage
Reduce Waste

and therefore

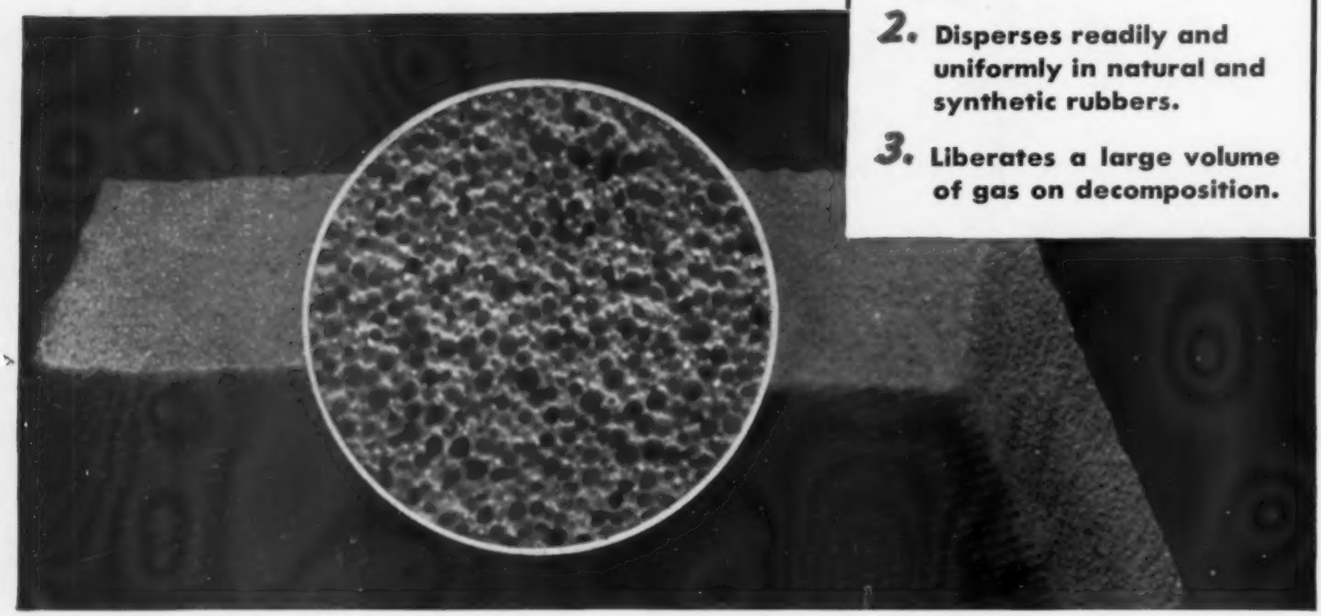
SAVE DOLLARS

R. T. VANDERBILT CO., INC.
230 PARK AVENUE, NEW YORK 17, N. Y.

NEW Du Pont UNICEL ND

Non-discoloring sponge rubber blowing agent

1. Produces small-celled sponge of extreme uniformity.
2. Disperses readily and uniformly in natural and synthetic rubbers.
3. Liberates a large volume of gas on decomposition.



THE UNIFORM small cell structure of sponge blown with Unicel ND is shown in the magnified section of the above photograph. Uniform cell structure is made possible by the excellent solubility of Unicel ND in elastomers. This results in extremely uniform dispersion . . . eliminates the need for close production controls during mixing and plasticization. The high blowing pressure developed by Unicel ND minimizes the effect which elastomer plasticity has on uniformity of cell structure. And compared with less powerful blowing agents, smaller amounts of Unicel ND are required.

Acidic materials, such as stearic acid, in amounts greater than those required to control rate of cure, may be omitted from the compound if desired without appreciably affecting the blowing characteristics of Unicel ND. This improved blowing agent is light in color and its use results in light colored sponge which will not discolor lacquered or painted surfaces under ordinary conditions of exposure.

More complete information on Unicel ND is contained in Report 47-3. Write us for extra copies. Rubber Chemicals Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co., (Inc.), Wilmington 98, Del.

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

DU PONT

THE RUBBER AGE, published monthly by The Palmerton Publishing Co., Inc., Printing Office, East Stroudsburg, Pa. Editorial and Advertising Offices at 250 West 57th Street, New York 19, N. Y. Entered aa second class matter October 20, 1933, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. Subscription in United States, $3.00 a year; Canada, $3.50; Foreign, $4.00. June, 1947. Vol. 61, No. 3.

PUBLIC LIBRARY
JUN 28 1947
DETROIT

SUPERB OIL RESISTANCE

is only one of Hycar synthetic rubber's unusual and valuable properties. Others are listed in the box at the right.

But most important, these properties may be had in an almost limitless number of combinations, each designed to meet specific service conditions of the finished Hycar part.

Our files contain more than 5000 recipes for Hycar compounds—each compound engineered to do a certain job. Parts made from HYCAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say, ask your supplier for parts made from Hycar. Test them in your own application, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Department HB-6 B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. EXTREME OIL RESISTANCE — insuring dimensional stability of parts.
2. HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.
3. ABRASION RESISTANCE—50% greater than natural rubber.
4. MINIMUM COLD FLOW—even at elevated temperatures.
5. LOW TEMPERATURE FLEXIBILITY—down to —65° F.
6. LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.
7. AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.
8. HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.
9. NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

Hycar
Reg. U.S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

This advertisement appeared in a long list of carefully selected business papers TO HELP YOU SELL parts made from HYCAR.

OH—SO NEW!

Yes, Philblack-O is a brand new graduate from our school of carbon blacks, and he comes to you for employment. He has passed all the hardest tests we could devise, both in the laboratory and on the road—and all with top honors! He's ready and qualified for your toughest assignment.

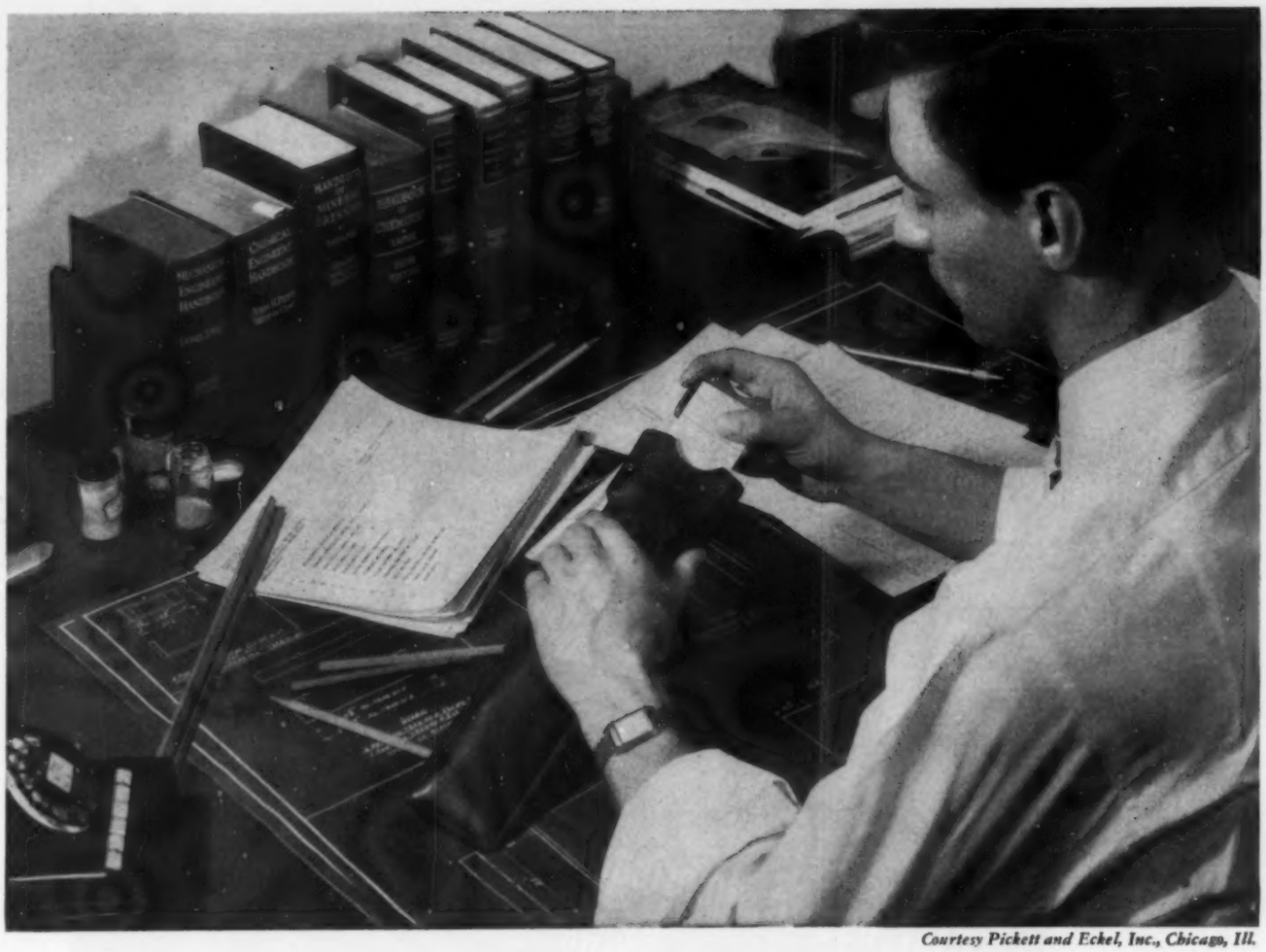
Tires made with Philblack-O show greater resistance to abrasion—better resistance to cut and crack growth—excellent low heat build-up. Put Philblack-O to work for you in your products. We know you will be highly pleased when you compare his performance with what you have been obtaining.

Send for a free sample.

PHILLIPS PETROLEUM COMPANY

Philblack *Division*

EVANS SAVINGS AND LOAN BUILDING · AKRON 8, OHIO



Courtesy Pickett and Eckel, Inc., Chicago, Ill.

Slide rule case made from GEON resins suggests applications in every industry

THAT slide rule case was made from GEON polyvinyl resins for several definite reasons. For one thing it will last indefinitely because it resists abrasion, sunlight, aging, perspiration. It's easy to clean because dirt can't penetrate its smooth surface. It's lightweight and easy to handle. It won't rub off on other materials.

All these facts—and many more—apply just as well to the literally limitless number of other products that can be made from GEON. For in addition to the properties of the slide rule case, products made from GEON can be resistant to oils, chemicals, heat, cold, mildew, and most other normally destructive factors.

And GEON can be pressure or injection molded, extruded, calendered or cast into sheet or film. In solution or latex forms it can be applied as coatings or impregnants for fabrics, fibres, paper and cardboard. Products made from GEON may be flexible or rigid, clear or opaque, brilliantly or delicately colored.

Products made from GEON range from shower curtains to tank linings, fly swatters to wire insulation, upholstery to highway markers—and many, many more.

Doesn't all this suggest some product that could be made better from GEON?

While we make no finished products from GEON, we'll be glad to help you with special problems or applications. For more information, please write Dept. R-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ont.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

Good-rite
VULTROL
for use in American rubber compounding
to prevent scorching, and for recovering
scorched stocks
GOOD-RITE AND VULTROL REG T M U S PAT OFF

For technical data please write Dept. CB-6

B. F. Goodrich Chemical Company

A DIVISION OF
THE B. F. GOODRICH COMPANY

ROSE BUILDING, CLEVELAND 15, OHIO

■ Calcium Nitrate

REAGENT • PURIFIED • TECHNICAL

Available forms range from the four-water crystal reagent grade product assaying 101-104% $Ca(NO_3)_2 \cdot 4H_2O$, (35% H_2O) to the essentially anhydrous technical grade assaying 98% min. $Ca(NO_3)_2$, (2% H_2O). All are low in metallic impurities, particularly copper, nickel, iron and manganese. Such a selection provides a product suitable for any of the industrial applications of Calcium Nitrate, some of which are: in the production of rubber goods; starch adhesives; radio tubes and electric light bulbs; explosives, matches and pyrotechnics; in the preparation of heat transfer salts and compositions for treating incandescent mantles; as well as a number of patented processes.

For Your Fine Chemical Needs ★

■ Potassium Nitrite

TECHNICAL AND CRYSTAL, REAGENT

Production of technical grade Potassium Nitrite in commercial quantities was pioneered by Baker & Adamson Research to meet vital wartime needs. Now this Fine Chemical is available to Industry exclusively from B&A for a host of wide-ranging uses, including: regeneration of heat transfer salts; removal of scale from tungsten rods; manufacture of diazo dyes; as a rust inhibitor, etc. The fused lump technical grade assays 90% min. KNO_2.

Rely on General Chemical's

■ Zinc Formate

Another example of a laboratory chemical brought into commercial production by B&A to meet customer requirements. The purified grade offered is in white, free-flowing granular form, assaying 99.5% $Zn(CHO_3)_2 \cdot 2H_2O$, and low in metallic impurities. New as an industrial chemical, Zinc Formate holds promise in many fields. Suggested uses include: as a catalyst in manufacture of methyl alcohol; production of pure zinc oxide; agent for waterproofing cellulosic materials and weighting silk, etc.

Baker & Adamson Division

★ This is the second in a series of advertisements reviewing the B&A Fine Chemicals commercially available to American Industry today from the Baker & Adamson Division of General Chemical Company. Scores of such purity products await your investigation. To learn more about these or other B&A Fine Chemicals that meet your requirements, write or phone nearest B&A Sales and Technical Service Office.

GENERAL CHEMICAL COMPANY

BAKER & ADAMSON DIVISION

40 RECTOR STREET, NEW YORK 6, N. Y.

Sales and Technical Service Offices: Albany* • Atlanta • Baltimore • Birmingham* • Boston • Bridgeport Buffalo* • Charlotte* • Chicago* • Cleveland* • Denver • Detroit* • Houston • Kansas City Los Angeles* • Minneapolis • New York* • Philadelphia* • Pittsburgh* • Providence • St. Louis* San Francisco* • Seattle • Wenatchee (Wash.) • Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal* • Toronto* • Vancouver*

SETTING THE PACE IN CHEMICAL PURITY SINCE 1882

*Complete stocks carried here.

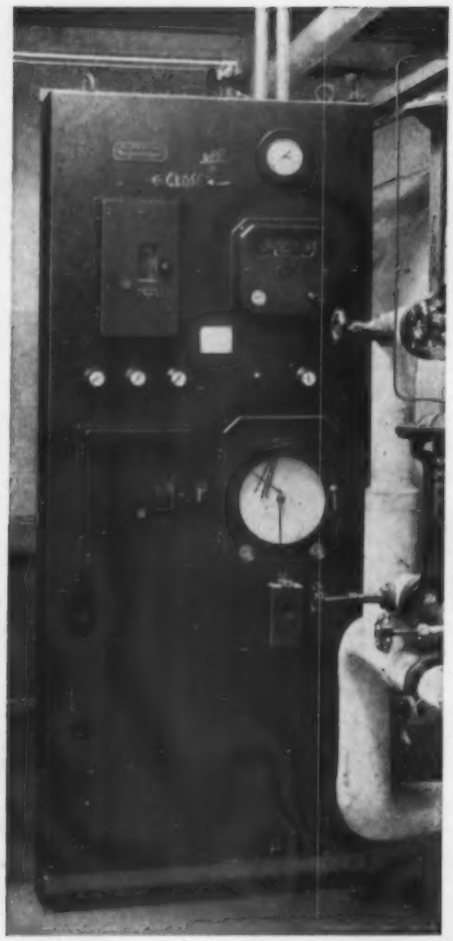
FINE CHEMICALS

BAKER & ADAMSON B&A QUALITY

STANDARD OF PURITY

FOR AMERICAN INDUSTRY

Hewitt takes Taylor "cure" for rising costs!



WHEN you can't cut material or labor costs, the only thing left to do is increase efficiency. So when Hewitt Rubber decided to invade the highly competitive foam rubber market, they got off to a head start by ordering a battery of Adamson-United Vulcanizers, each equipped with Taylor Instrument Controls.

The result is the whole curing process is run automatically with human error cut to a minimum. Operators are thus relieved of responsibility for maintaining product quality. All they have to do is load the machines and let the Taylor Control System do the rest. The only man who can make a mistake is the engineer who establishes the cycle.

Here's how the system works:

1. Operator pushes button.

2. Door closes and Flex-O-Timer starts.

3. Timer locks door (if it doesn't lock, cycle stops).

4. Timer turns on steam, then stops and turns on smaller "cure" timer.

5. Before curing temperature is reached, Indicating Fulscope Temperature Controller closes blowdown valve.

6. At end of cure, curing timer stops and re-starts master timer.

7. Blowdown valve opens and steam shuts off.

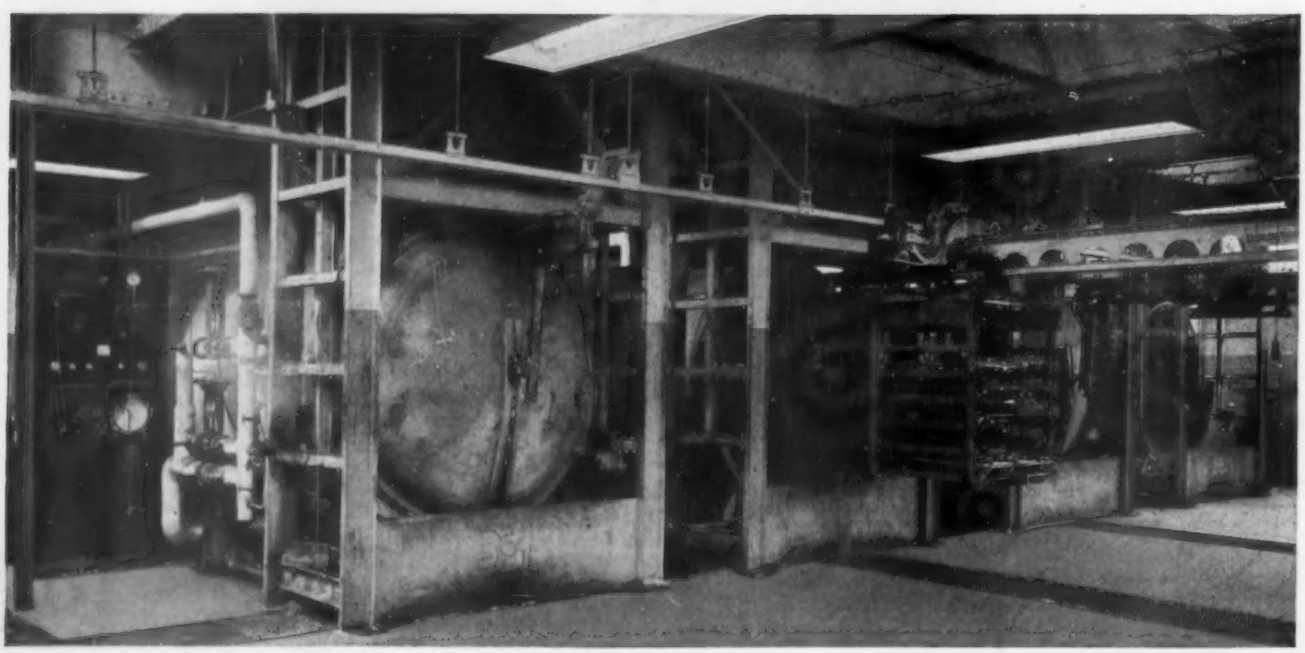
8. Timer opens door *provided pressure in vulcanizer* drops to zero. (Door can't open until it does).

This is one of many Taylor Control Systems that can help you keep quality up and costs down. Ask your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, New York, or Toronto, Ontario.

• • •

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY



Master batches of Pliolite S-6 being loaded at Goodyear factory

The finest reinforcing agent yet produced—**PLIOLITE S-6**—is now available in unlimited quantities.

A light-gravity, non-discoloring compound, **PLIOLITE S-6** is especially valuable in reinforcing synthetic rubbers. It affords these four practical advantages:

1. Provides more uniform, more easily handled compounds because it acts as a plasticizer at processing temperatures.

2. Its reinforcement is positive—coupling extra hardness with negligible loss in elongation. Often elongation is increased.

3. Its thermoplasticity makes it a very useful processing aid for smooth extrusions and molded products.

4. Its uniformity is assured by a constant quality control check.

You will find **PLIOLITE S-6** to be highly satisfactory for all compounds needing a light-color, low-gravity stock of 70-90 durometer hardness with good processing characteristics and moldability. It is effective with GRS, Neoprene, Buna N and natural rubber. Available as a powder for your own mixing, or in master batches in whatever synthetic you select. For complete information and sample, write: Goodyear, Chemical Products Division, Plastics and Coatings Dept., Akron 16, Ohio.

Pliolite—T.M. The Goodyear Tire & Rubber Company

GOODYEAR

THE GREATEST NAME IN RUBBER

RUBBER

OUR NATIONWIDE ORGANIZATION IS EQUIPPED TO SERVE YOU PROMPTLY FROM STRATEGICALLY LOCATED CENTERS

Boston 10, Mass., 80 Federal Street

Buffalo 2, N. Y., 443 Delaware Avenue

Charlotte 1, N. C., 224 West 2nd Street

Chicago 4, Ill., 23 E. Jackson Boulevard

Cincinnati 2, Ohio, 2906 Carew Tower

Detroit 2, Mich., 501 Stephenson Building

Los Angeles 21, Calif., 1315 E. 7th Street

New Orleans 12, La., 731 Whitney Natl. Bank Bldg.

New York 1, N. Y., Empire State Building

Philadelphia 3, Pa., 1600 Arch Street

Portland 4, Ore., 717 Lewis Building

Providence 1, R. I., 200 Grosvenor Building

Rochester 4, N. Y., 70 Exchange Street

St. Louis 10, Mo., 4030 Chouteau Avenue

San Francisco 4, Calif., 405 Montgomery Street

Toronto, Ontario, Canada, 250 Van Horn Street

STEIN SH HALL

285 MADISON AVENUE — NEW YORK 17, N. Y.

EST 1866

BEGINNING
JULY 1st...
SHARPLES
TRADE
MARK
CHEMICALS

DIRECT DISTRIBUTION

BEGINNING JULY 1st...

SHARPLES CHEMICALS INC. will distribute DIRECTLY to the rubber industry the following VULCANIZATION ACCELERATORS:

SHARPLES ACCELERATOR	CHEMICAL NAME
62	TETRAETHYLTHIURAM DISULFIDE
67	ZINC DIETHYLDITHIOCARBAMATE
66	SELENIUM DIETHYLDITHIOCARBAMATE
52	TETRAMETHYLTHIURAM DISULFIDE
57	ZINC DIMETHYLDITHIOCARBAMATE
77	ZINC DIBUTYLDITHIOCARBAMATE

SHARPLES TRADE MARK CHEMICALS

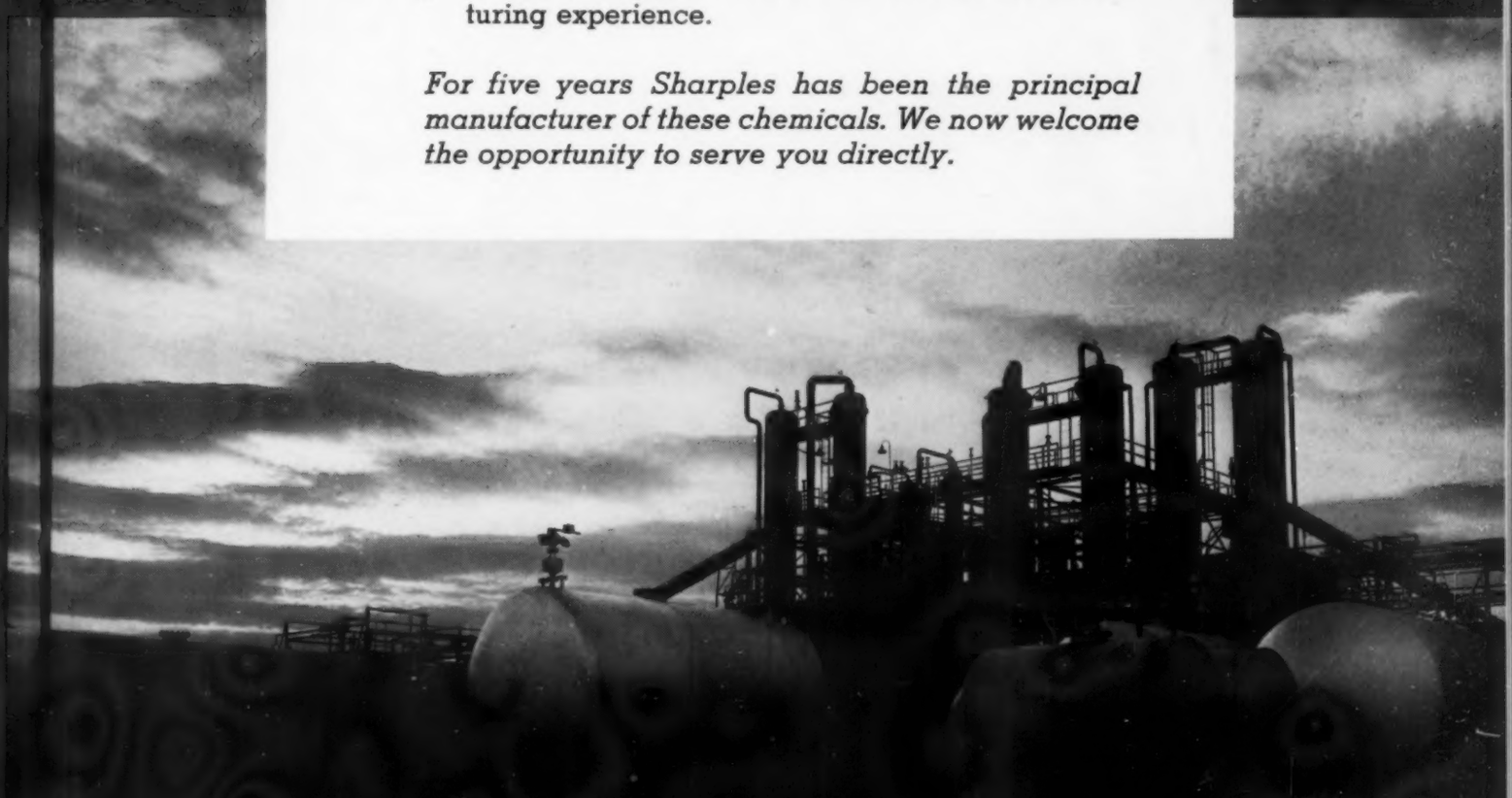
SHARPLES CHEMICALS INC.

OF ULTRA ACCELERATORS!

WE SHALL PLACE AT YOUR SERVICE...

- A Sales Organization composed of technically trained men of wide experience and recognized standing throughout the rubber industry.
- A completely equipped Rubber Service Laboratory.
- A completely equipped Rubber Research Laboratory.
- Sales Offices and warehouses, strategically located throughout the United States, Canada and other countries.
- A three-way identification system for each accelerator.
- Over twenty years successful chemical manufacturing experience.

For five years Sharples has been the principal manufacturer of these chemicals. We now welcome the opportunity to serve you directly.



PHILADELPHIA • NEW YORK • CHICAGO • AKRON • LOS ANGELES

SAN FRANCISCO • SEATTLE • PORTLAND • MONTREAL

DOUBLE-CHECKED CHEMICALS FOR THE RUBBER INDUSTRY

ACCELERATORS (See Inside)
TETRAALKYLTHIURAM DISULFIDES
DIALKYLDITHIOCARBAMATES

WAX
SHARPLES WAX (Anti-Sunchecking Wax)

SOLVENTS
AMYL CHLORIDES DICHLOROPENTANES

VULCANIZING AGENTS
VULTACS (Alkylphenol Sulfides)

INTERMEDIATES FOR RUBBER CHEMICALS
ETHYLAMINES BUTYLAMINES ISOPROPYLAMINE

PLASTICIZERS
ALKYLPHENOLS, ALKYLNAPHTHALENES
SHARPLES GILSONITE (A Plasticized Gilsonite)

POLYMERIZATION CONTROLLER
3B MERCAPTAN (tert-dodecylmercaptan)

SHARPLES CHEMICALS INC.

PHILADELPHIA, NEW YORK, CHICAGO, AKRON

Warehouses: Providence, Trenton, Akron, Chicago, Los Angeles, San Francisco
West Coast: MARTIN, HOYT & MILNE, INC., Los Angeles, San Francisco, Seattle, Portland
Canada: SHAWINIGAN CHEMICALS LTD., Montreal, Quebec . . . Toronto, Ontario
Export: AIRCO EXPORT CORP., New York City

We make all types and sizes of rolls . . . to exact specifications . . . for natural or synthetic rubber processing requirements.

The pair illustrated are 28" x 42" cracker rolls—among the largest ever made—for use in the reclamation of giant airplane and tractor tires.

When you need rolls for renewals, or for new processing equipment, it will be to your advantage to specify UNITED ROLLS. Thirty years experience serving the industry, and our unexcelled facilities for precision manufacture, are your assurances of complete satisfaction.

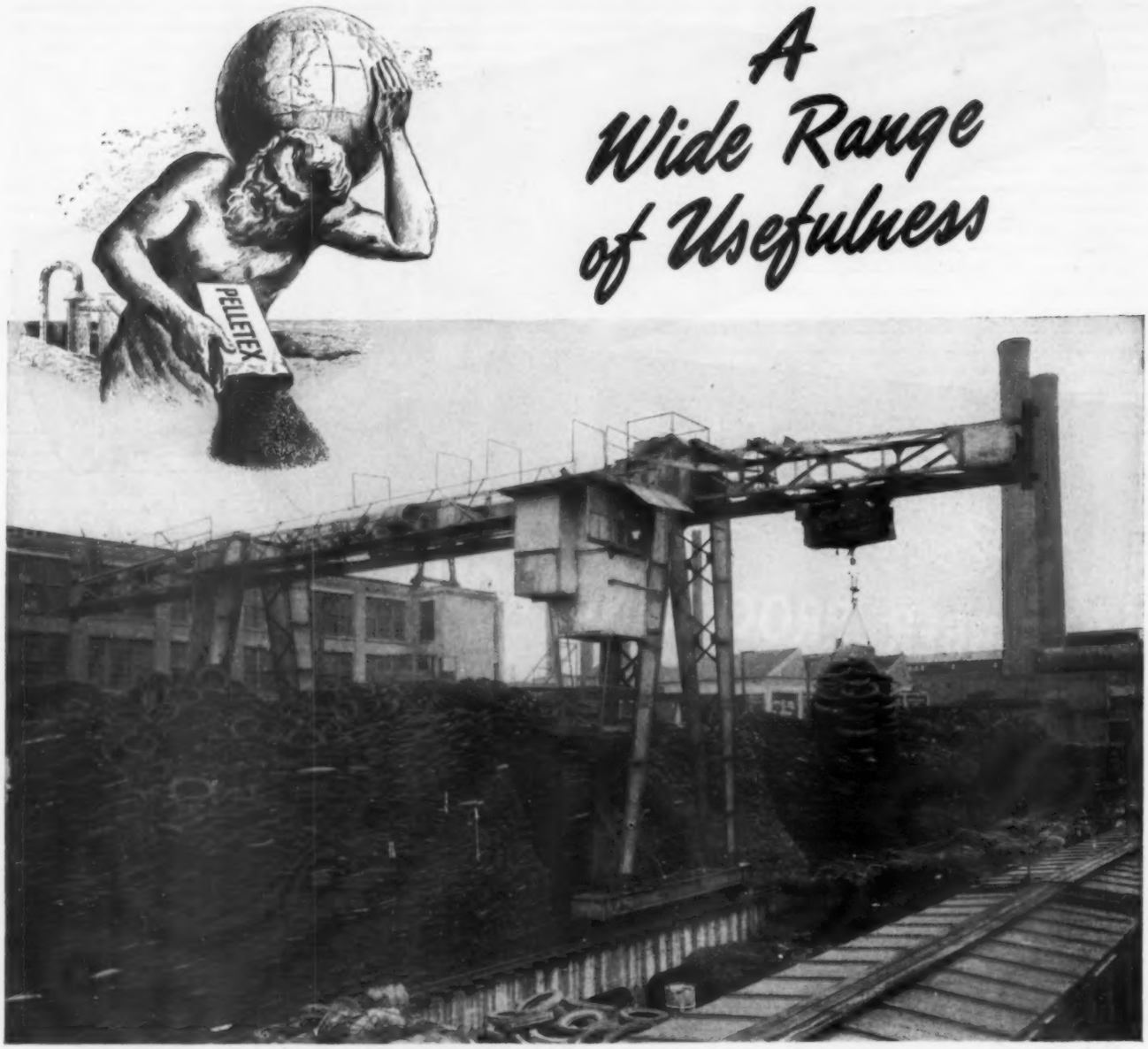
REG. T. M.

UNITED ENGINEERING AND FOUNDRY COMPANY

Pittsburgh, Pennsylvania

Plants at Pittsburgh · Vandergrift · New Castle · Youngstown · Canton

Subsidiary: Adamson United Company, Akron, Ohio
Affiliates: Davy and United Engineering Company, Ltd., Sheffield, England · Dominion Engineering Works, Ltd., Montreal, P. Q. Canada



A Wide Range of Usefulness

PELLETEX for RECLAIM

The value of Pelletex, leading S R F Black, in the refining process of reclaimed rubber is well known. The reclaim is more homogeneous, smoother, less nervy and shows improved physical properties such as higher tensile strength and elongation.

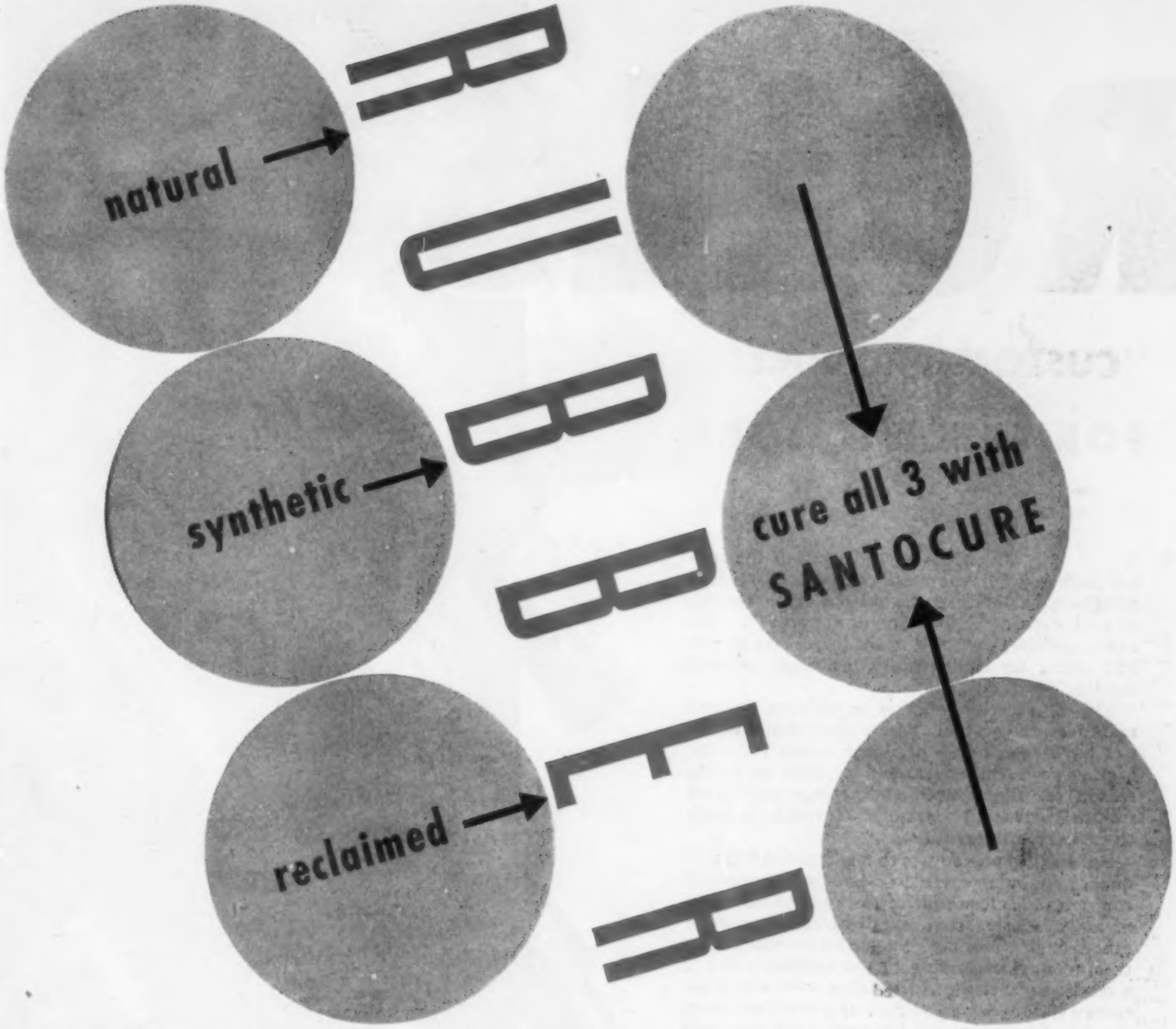
Also highly regarded is the use of Pelletex by the rubber manufacturer using reclaims. The compounds are smooth and the molding characteristics are improved.

Lower production costs by the use of Pelletex is another important advantage.

Our technical staff is at your service.

MANUFACTURER
GENERAL ATLAS CARBON CO.
PELLETEX
PAMPA, TEXAS
GUYMON, OKLA.

DISTRIBUTOR
HERRON BROS. and MEYER
NEW YORK, N. Y.
AKRON, OHIO



Plant men quickly recognize the possibilities of simplifying their inventory problems by using Santocure* as an accelerator for natural, synthetic or reclaimed rubber — or all three! Santocure turns in a highly satisfactory performance under a variety of conditions —

1 **Wide range of cures possible through choice of activators.**

2 **Handles well in high black stocks.**

3 **Assures safe processing.**

4 **Quick cures at vulcanizing temperatures.**

5 **Good flow in molds.**

6 **Clean, sharp molding.**

7 **Excellent aging.**

You are likely to find it profitable to have Monsanto work with you on your accelerator or antioxidant problems. Write MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Bank Building, Akron, Ohio. *Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

ROLLS

"CUSTOM-PRODUCED"

FOR SPECIFIC JOBS

In supplying the needs of the rubber industry for the past century, Farrel-Birmingham has learned the precise requirements of each type of rubber processing roll . . . the exact qualities each roll needs to best do its job and stand up under the punishment it will receive.

The application of this experience in roll manufacture in a plant where exceptional facilities have been developed, and where only the highest grade materials are used, adds up to the reason for the built-in competence and extra service life that rubber manufacturers have come to expect from F-B rolls.

Production procedures that safeguard F-B roll quality include: correct design by experienced engineers . . . close control throughout each step of manufacture, from metallurgical analysis of raw materials and prescription of the metal mixture, to final inspection of the finished roll . . . a method of casting chilled iron rolls which assures a hard working surface of correct and even depth and preserves the strength of the gray iron structure of the roll body . . careful machining by the most advanced methods . . . grinding bodies and journals to required accuracy and finish, with straight, crowned or concave face.

When you need rolls or other rubber processing equipment for specific applications, call on Farrel-Birmingham.

FB-348

FARREL-BIRMINGHAM CO., Inc.
ANSONIA, CONN.

Plants: Ansonia, Derby and Stonington, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, Stonington, New York, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston, Charlotte

Farrel-Birmingham

SPHERON 6*

The wear which Cabot's Spheron 6 (MPC)* puts into tire treads is an all-important factor for the tire maker. Rugged reinforcement is there, whether the stock is natural or synthetic. The resistance to tear and abrasion so characteristic of Spheron 6 helps bring drivers back for another set, when replacement time rolls around.

CABOT

GODFREY L. CABOT, INC.

77 FRANKLIN STREET
BOSTON 10, MASS.

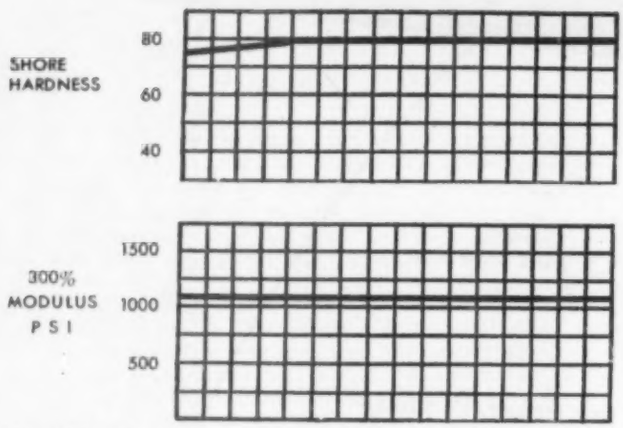
SOLKA-FLOC*

PURE, FINELY DIVIDED WOOD CELLULOSE

FOR RUBBER COMPOUNDING

*REG. TRADE MARK

For HIGH HARDNESS with LOW MODULUS

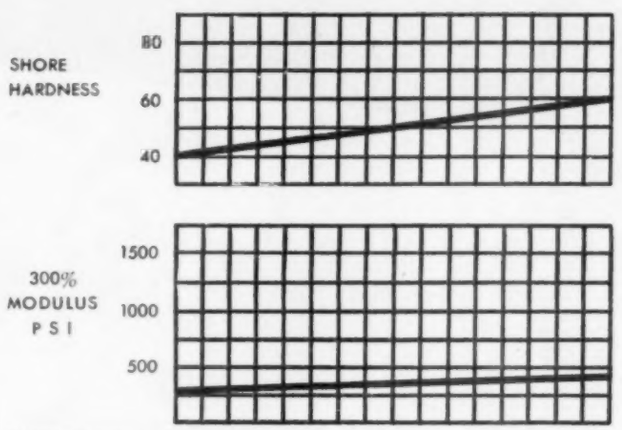


PARTS BY WT.	0	2½	5	10	15	20
PARTS BY VOL.	0	1.9	3.8	7.7	11.5	15.4

OF SOLKA-FLOC IN THE FOLLOWING RECIPE

GR-S	100.0
Paraffin	1.0
Zinc Oxide	3.0
"Agerite Hipar"	1.0
Iron Oxide	3.0
MPC Black	0.4
Copper Diethyl Dithiocarbamate	0.75
Sulfur	2.0
Hydrated Calcium Silicate	75.0

CURE: 12 MINUTES @ 320 °F.



PARTS BY WT.	0	2½	5	10	15	20
PARTS BY VOL.	0	1.9	3.8	7.7	11.5	15.4

OF SOLKA-FLOC IN THE FOLLOWING RECIPE

Smoked Sheet	100.0
Zinc Oxide	6.0
Sulfur	3.0
Mercaptobenzothiazole	1.0
Stearic Acid	3.0
Phenyl Beta Naphthylamine	1.0

CURE: 40 MINUTES @ 280 °F.

It is apparent from the above data that SOLKA-FLOC is unusual in its capacity to produce major increases in hardness with a minimum of change in modulus. This characteristic should be of value to manufacturers of all types of rubber goods. You are, therefore, invited to write for details on the application of the various SOLKA-FLOC items. Samples best suited to the specific requirements involved will be supplied in accordance with your statement of the problem.

BROWN COMPANY

FOREMOST PRODUCERS QUALITY PURIFIED CELLULOSE

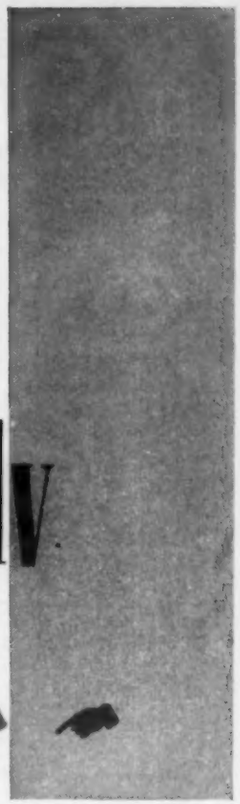
PULP SALES OFFICES: 500 FIFTH AVE., NEW YORK 18, N. Y. • 465 CONGRESS ST., PORTLAND 3, ME.
110 S. DEARBORN ST., CHICAGO 3, ILL. • 58 SUTTER ST., SAN FRANCISCO 4, CAL.
BROWN CORPORATION 906 SUN LIFE BLDG. MONTREAL 2, P.Q., CANADA

you get more for your money . . .

when you specify

Picco HiSolv

AROMATIC
PETROLEUM SOLVENTS



and this is why . . .

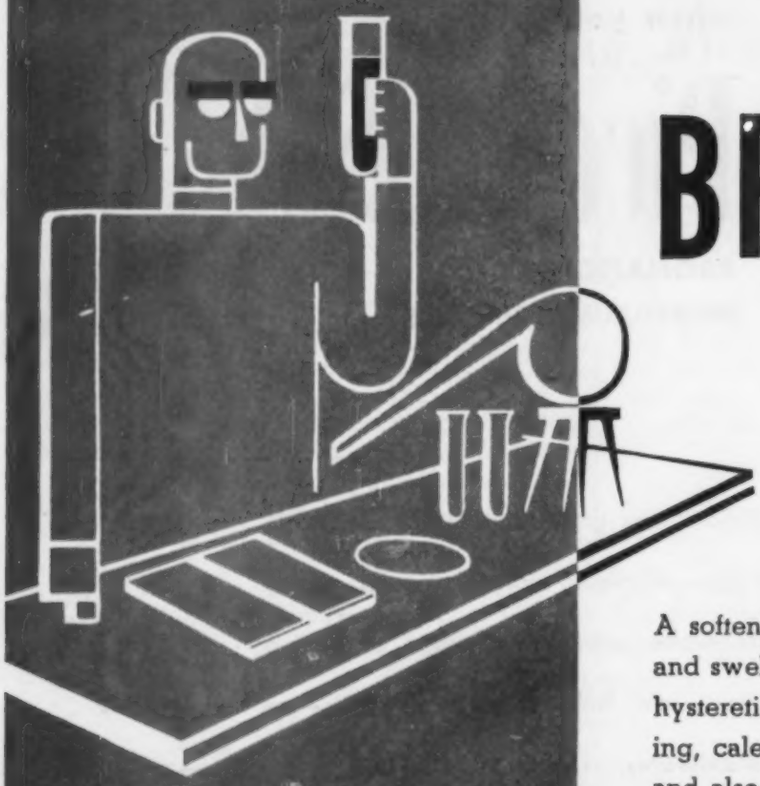
In Picco HiSolv you get many highly desirable characteristics—maximum solvent power, good odor, water-white color, wide range of boiling points. They are fully refined products—no unstable unsaturates.

Broad experience in the manufacture of coal tar products is utilized in the production of Picco HiSolv. They are made in large volume and are *available now!*

Write for data and samples. Specify boiling range desired.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.
CLAIRTON, PENNSYLVANIA
Plants at Clairton, Pa. and Chester, Pa.
Makers of: Coumarone Resins • Coal Tar Solvents • Styrene Resins • Rubber Plasticizers • Reclaiming Oils • Terpene Resins • High Solvency Naphthas • Solvent Oils
Distributors to the Rubber Industry, STANDARD CHEMICAL COMPANY • Akron, Ohio

FROM THE CATALOG OF BARRETT RUBBER COMPOUNDING MATERIALS...



BRS 700

This recent addition to the Barrett Rubber Compounding Materials line is a black viscous fluid refined from coal tar.

A softener and extender of the solvent and swelling type, BRS 700 confers good hysteretic properties, improves processing, calendering and tubing properties, and also improves resistance to tear and crack-growth. Its principal use is in tire treads and mechanical goods. It is inexpensive and very easy to handle.

Inquiries are invited. Send for Barrett Rubber Laboratory Release No. 4 which contains sample recipes using BRS 700.

Available in drums and tank cars.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

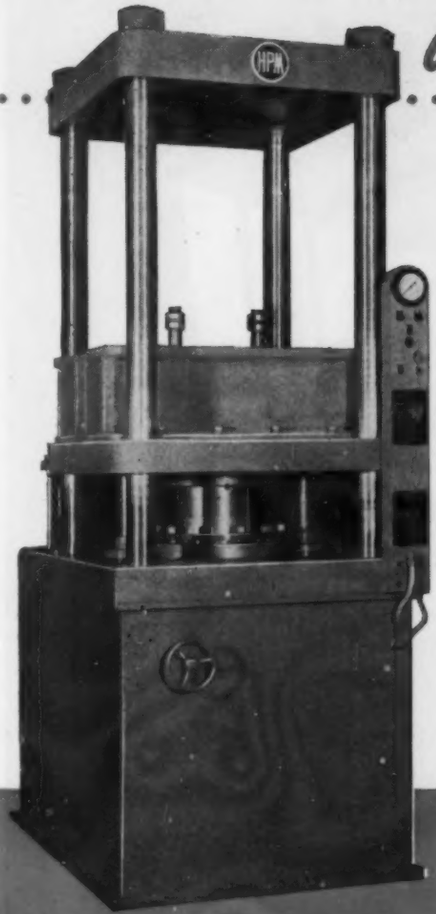
In Canada: The Barrett Company, Ltd.,
5551 St. Hubert Street, Montreal, Que.

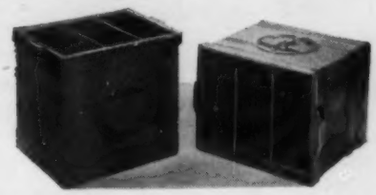
*Trade-mark Reg. U. S. Pat. Off.

Barrett*

You probably don't make battery boxes,

but they may give you ideas





This H-P-M Press was tooled up to mold hard rubber battery boxes—a job it's handling well and economically. But it's a versatile press, capable of stepping into your plant and doing your rubber molding work rapidly, efficiently, dependably.

If you need other molding machines

H-P-M makes the Turbojector, an injection molding machine for rubber, on which you can make rubber moldings at surprisingly low cost. Production is fast, because preforms are eliminated, curing time is greatly reduced and trimming operations are minimized, because there is no flash.

H-P-M Hot Plate Presses are available in many sizes and capacities for laminating, vulcanizing and molding. H-P-M Transfer Presses cut costs on many molding operations. H-P-M Presses assure low upkeep, while delivering high output.

Tell us your molding needs and let our engineers show you the savings obtainable from modern H-P-M Presses.

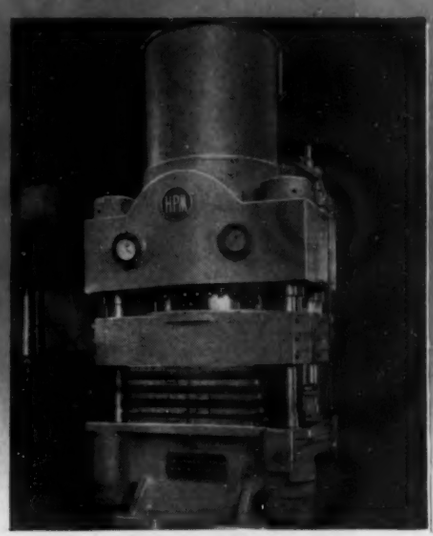
THE HYDRAULIC PRESS MANUFACTURING COMPANY

1014 Marion Road • Mount Gilead, Ohio • U.S.A.

Branch Offices in New York, Philadelphia, Cincinnati, Cleveland, Columbus, O., Detroit, Pittsburgh and Chicago. Representatives in other principal cities. Export Dept: 500 Fifth Avenue, New York, N. Y. Cable—"Hydraulic"

Transfer Press

Turbojector

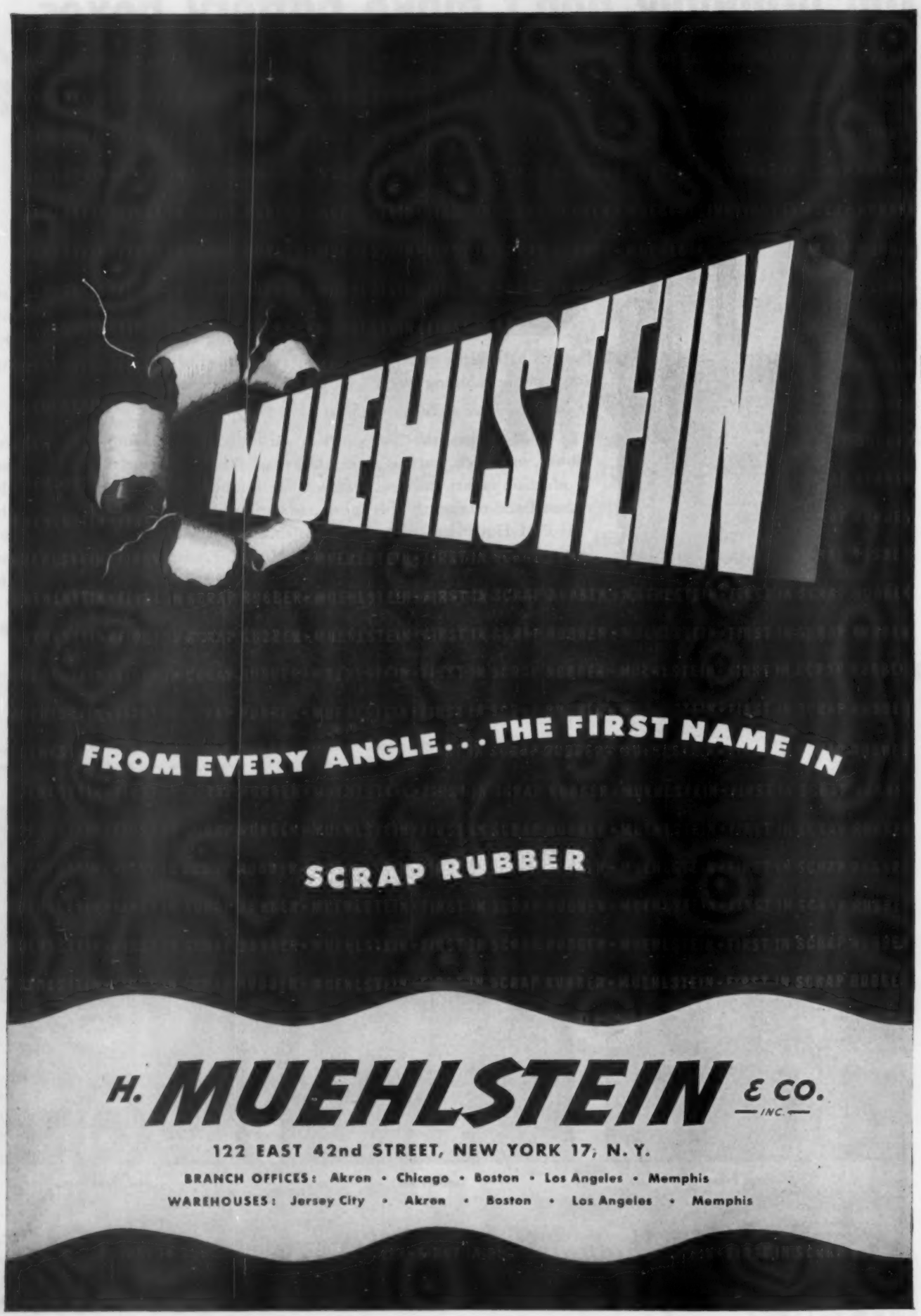


Hot Plate Press

HPM

All-Hydraulic Self-Contained **MOLDING PRESSES**

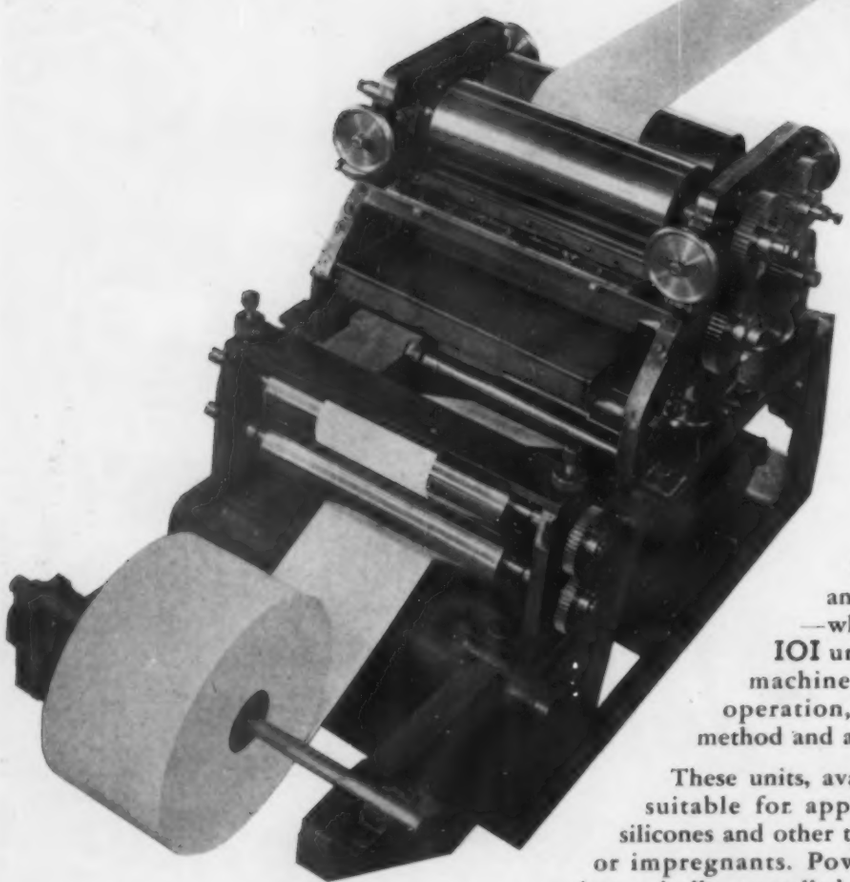
REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877


MUEHLSTEIN
FROM EVERY ANGLE...THE FIRST NAME IN
SCRAP RUBBER
H. MUEHLSTEIN & CO. INC.
122 EAST 42nd STREET, NEW YORK 17, N. Y.
BRANCH OFFICES: Akron • Chicago • Boston • Los Angeles • Memphis
WAREHOUSES: Jersey City • Akron • Boston • Los Angeles • Memphis

NEVILLE
... a mark of quality and service
COUMARONE RESINS
ALKYLATED PHENOL RESINS
PLASTICIZING OILS
COAL-TAR SOLVENTS AND OILS
NEUTRAL AND SHINGLE STAIN OILS
RUBBER RECLAIMING OILS
CHEMICAL SPECIALTIES
THE NEVILLE COMPANY
PITTSBURGH, 25, PA.
Chemicals for the Nation's Vital Industries

A-25

RIGHT START FOR A *Fine Finish*



UNIVERSAL TYPE COATING MACHINE ...IOI ENGINEERED

• It augurs well for a fine finish on any web material—fabric, paper, or film —when it gets off to a flying start on an **IOI** universal type coating machine. This machine provides unusual flexibility of operation, easy interchangeability of coating method and accuracy of coating thickness.

These units, available for webs up to 60" wide, are suitable for application of hydrosols, organosols, silicones and other types of organic or inorganic coatings or impregnants. Powered by mechanical, hydraulic or electronically controlled drives, they can be synchronized with windup stands, drying oven conveyors, and tension or pull rolls as required in any particular coating system.

IOI coating machines are precision machines throughout, featuring precision-ground rolls, highly accurate bearing mountings, hollow rolls for heating or cooling, micrometer roll adjustments and micrometer doctor blade adjustments.

These machines, adaptable for roller coating, dip and flow coating, or scraper knife coating, are typical of **IOI** ingenuity in the engineered application of heat in continuous operations.

See our Catalog in Sweet's File—Process Industries. Complete details of IOI installations adaptable to your industry are also available in booklet form.

Heat at Work...in CONTINUOUS OPERATIONS

INDUSTRIAL IOI OVENS, INC.

IOI ENGINEERING VERSATILITY

13825 TRISKETT ROAD CLEVELAND 11, OHIO

ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON W.1, ENGLAND

4 BAKER CHEMICALS of interest to The Rubber Industry

MAGNESIUM OXIDE
(Neoprene Grade)

A very light, finely-divided powder completely uniform in bulk density, particle size, and chemical activity. Calcined in electric furnaces to insure dependable performance when it is compounded with neoprene and other synthetic rubbers.

MAGNESIUM CARBONATE
(Technical Light Powder)

Particular emphasis is placed on uniformity of physical specifications, which reflect in trouble-free compounding of rubber products. Impurities such as iron and calcium are extremely low due to exacting chemical control.

CALCIUM NITRATE
(Technical Crystal)

A high purity chemical especially manufactured to meet the requirements of compounders of latex products. It is produced as creamy-white crystals 1½" and smaller in diameter, containing 3 molecules of water of crystallization.

CARBON DISULFIDE
(Carbon Bisulfide)

Freedom from other sulfides (Assay of 99.99%) makes Baker's carbon Disulfide a preferred solvent in the rubber industry. Manufacture by a unique electro-thermic method, with continuous rather than batch distillations, insures uniformity.

J. T. BAKER CHEMICAL CO.
Executive Offices: Phillipsburg, N. J.

Baker's Chemicals

C. P. ANALYZED · FINE · INDUSTRIAL

WE MAKE ONE GRADE OF

LIGHT MAGNESIUM OXIDE

AND IT IS TOPS!

K&M best in asbestos

THIS is the policy of Keasbey & Mattison... one and *only* one grade of light magnesium oxide. It reduces your problem to a minimum.

Always uniform in quality
Always light in weight
Manufactured under precise control from beginning to end
Made to meet compounders' needs
Available in large quantities

R. R. C.'s approved standard.

KEASBEY & MATTISON
COMPANY, AMBLER, PENNSYLVANIA

One of America's oldest and most reliable makers of asbestos and magnesia products. Founded 1873

OUR DISTRIBUTOR FOR K&M LIGHT MAGNESIUM OXIDE IS:

AMERICAN CYANAMID COMPANY

30 Rockefeller Plaza, New York 20, N. Y.

WITH SALES REPRESENTATIVES TO THE RUBBER INDUSTRY AND STOCK POINTS:

AKRON, OHIO, Akron Chemical Company
BOSTON, MASS., Ernest Jacoby & Company
CHICAGO, ILLINOIS, Herron & Meyer
LOS ANGELES, CAL., H. M. Royal, Inc.
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RESINEX

Economy with Availability

This polymerized aromatic resin series may well bring you relief from shortages of supposedly "essential" ingredients for your compounding needs today. . . . The RESINEX series can help ease the pressure of mounting production costs by giving you an extender for —

- Faster and easier incorporation in open mill or Banbury mixing.
- Better pigment dispersion and smoother stocks.
- Improved resistance to flex-cracking and cut-growth.
- Higher tensile with better elongation and tear properties.
- Smoother extrusion.
- Better mold flow with less sticking.
- Low cost with immediate availability for all purposes.

RESINEX L-4, for instance, is being used in an increasing number of plants with results comparable with the best of the old-line rubber softeners. Write for laboratory bulletin showing comparative results between Pine Tar and RESINEX L-4. Also, ask for new bulletin: "Facing the Carbon Black Shortage With Resinex."

HARWICK STANDARD CHEMICAL CO.

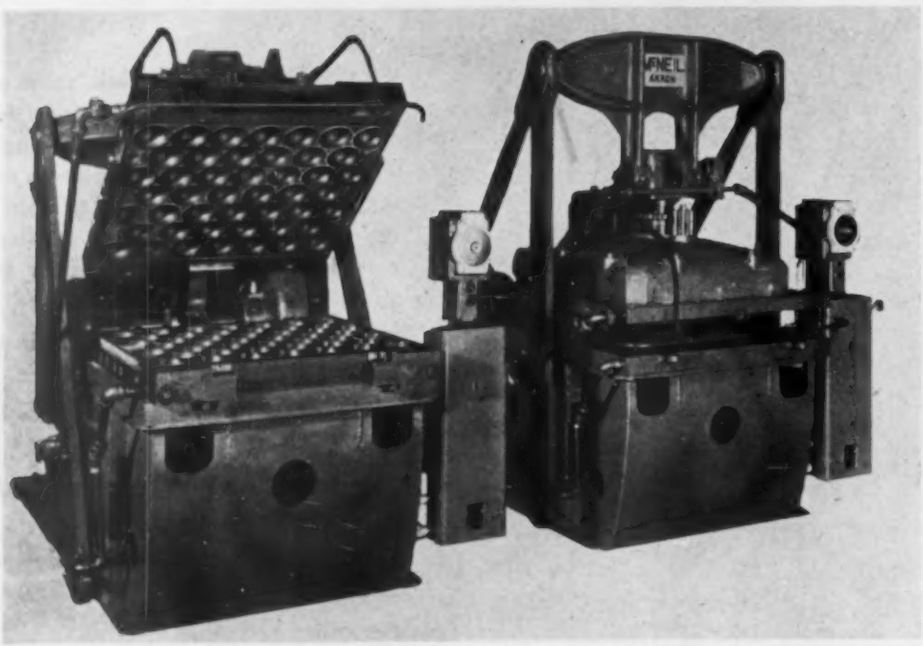
AKRON 8, OHIO

Branches: Boston . . . Trenton . . . Chicago . . . Los Angeles

MODERN PRESSES . . .

McNEIL PLATEN PRESSES FOR BLOWN GOODS OR SPONGE

Motor operated—No hydraulic. Made in 40″ x 40″ square platens, or if circular platens are desired, can be furnished in two sizes, 42″ for 110,000# total load or 52″ for 200,000# total load.



Two 40″ x 40″ platen presses good for 110,000# total load. This is an ideal type of press for zero pressure tires, play balls, hollow rubber toys or sponge rubber products.

All the experience and engineering skill of the McNEIL organization is at your call to help you increase efficiency and speed while lowering production costs. For tomorrow's production, check with McNEIL today.

We also make a Heavy Duty Line of Mechanical Goods Presses

Sales Agent—Eastern States
B. H. DAVIS
928 Glenview Rd., Ridgewood, N. J.

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McNEIL AKRON

The McNEIL Machine & Engineering Co.
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RUBBER WORKING MACHINERY • INDIVIDUAL CURING EQUIPMENT FOR TIRES, TUBES and MECHANICAL GOODS

Something New — Something Different

For The RUBBER INDUSTRY

KOSMOS • DIXIE • KOSMOS • DIXIE

60

UNITED CARBON COMPANY, INC.

CHARLESTON 27, W. VA.

NEW YORK • AKRON • CHICAGO • BOSTON

KOSMOS 60—DIXIE 60 . . . . . .

is something new, something different, something better in carbon black.

DIXIE 60—KOSMOS 60 . . . . . .

is a United furnace process carbon black. It possesses high structure, is powerful, active, and unbelievably good for rubber treads, both natural and synthetic.

KOSMOS 60—DIXIE 60 . . . . . .

is acclaimed for faster and smoother processing, high extrusion efficiency, less rejects at tuber, low shrinkage, glassy smoothness, dense appearance, freedom from ragged edges, and for remaining tackier longer.

DIXIE 60—KOSMOS 60 . . . . . .

is a fast curing black requiring low acceleration.

KOSMOS 60—DIXIE 60 . . . . . .

is an unusually high modulus black with outstanding reinforcement so essential for resistance to tread wear, cracking and cut growth.

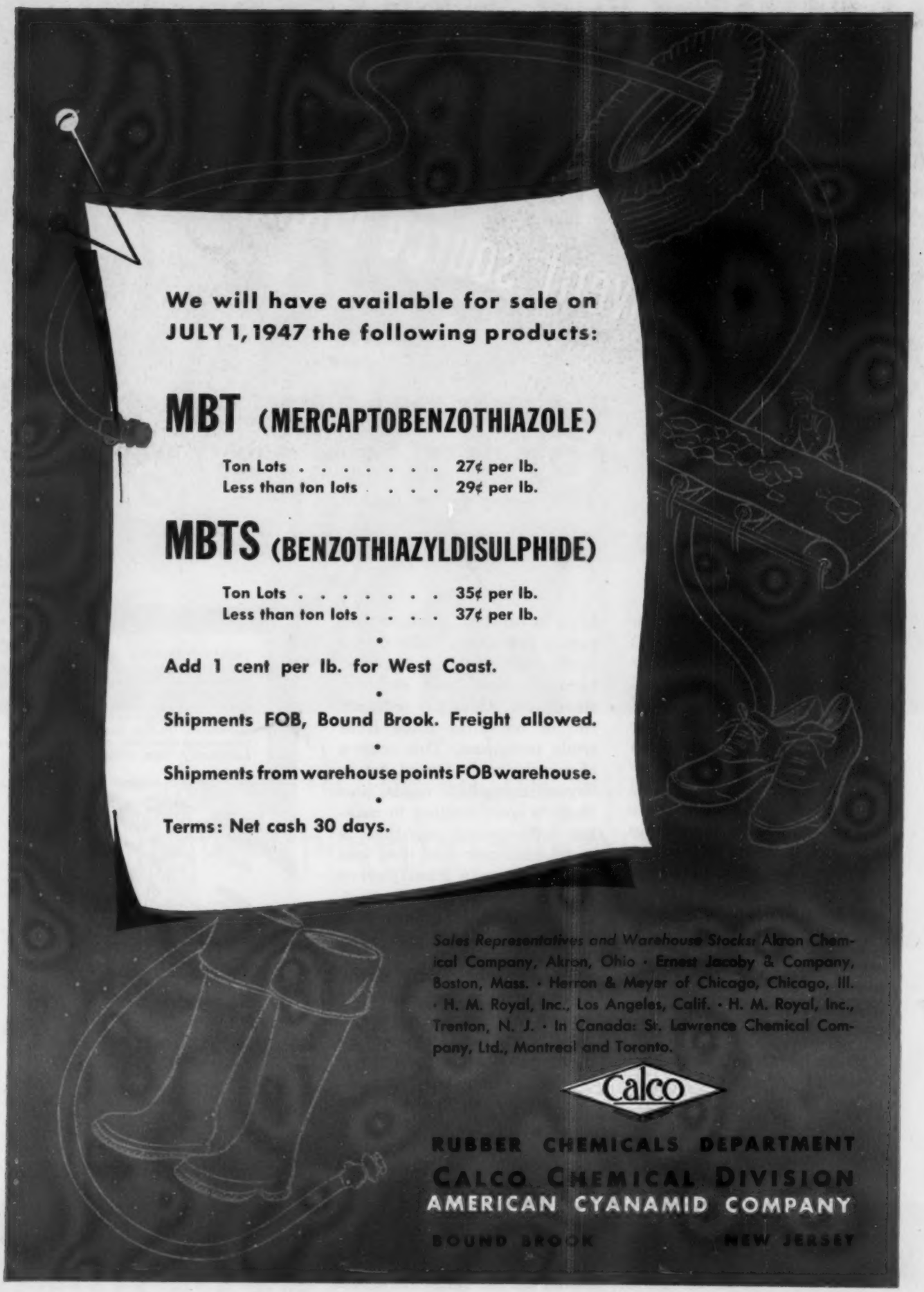
DIXIE 60—KOSMOS 60 . . . . . .

assures excellent performance under the severest conditions.

Available only in limited quantities for the present

UNITED CARBON COMPANY, Inc.

CHARLESTON, WEST VIRGINIA


We will have available for sale on
JULY 1, 1947 the following products:
MBT (MERCAPTOBENZOTHIAZOLE)
Ton Lots . . . . . 27¢ per lb.
Less than ton lots . . . . 29¢ per lb.
MBTS (BENZOTHIAZYLDISULPHIDE)
Ton Lots . . . . . 35¢ per lb.
Less than ton lots . . . . . 37¢ per lb.
Add 1 cent per lb. for West Coast.
Shipments FOB, Bound Brook. Freight allowed.
Shipments from warehouse points FOB warehouse.
Terms: Net cash 30 days.
Sales Representatives and Warehouse Stocks: Akron Chemical Company, Akron, Ohio · Ernest Jacoby & Company, Boston, Mass. · Herron & Meyer of Chicago, Chicago, Ill. · H. M. Royal, Inc., Los Angeles, Calif. · H. M. Royal, Inc., Trenton, N. J. · In Canada: St. Lawrence Chemical Company, Ltd., Montreal and Toronto.
Calco
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CALCO CHEMICAL DIVISION
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WHAT WOULD YOU DO...

if your solvent source couldn't ship?

Here's why you can count on Skelly
for supplies of highest quality solvents
for years to come

"DOC" MacGEE SAYS: Would you be in trouble if your solvent supply ran short? Then consider this fact: Some commercial naphthas are the products of sideline operations and their production is controlled—often interrupted—by the larger gasoline businesses from which they are derived. You should make sure your source can always ship promptly, without costly delays or without delivering an inferior product, thereby causing you to shut down operations.

Skellysolve can give you such assurance. For Skelly's ability to deliver supplies of close cut fractions for years to come is unsurpassed in the industry.

Skelly has an unusually large supply of "sweet" natural gas, in one of the few "unitized" fields in America. Such natural gas, as you know, yields better quality solvents, from an odor, taste, residue, and stability standpoint, than the ordinary run of naphthas made from crude petroleum. This reserve of superior raw material, ample beyond immediate needs, plus Skelly's specialization in making extra-quality naphthas, is your assurance that you can always obtain Skellysolve promptly—and that all shipments will be of uniform high quality. The record proves it.

So why risk costly delays when you know Skellysolve can furnish you ample supplies of close cut fractions for your needs many years hence? Whatever your solvent requirements, make it a habit to call on Skellysolve.

SKELLY PIONEERED the large scale production of hexane, heptane, and octane type naphthas from natural gas for the oil and fat, rubber, pharmaceutical, paint and chemical industries. Today, Skelly still pioneers in close cuts, constant uniformity, rigid control.

SKELLY

Skellysolve

SOLVENTS DIVISION, SKELLY OIL COMPANY, KANSAS CITY, MISSOURI

—turn to the highly efficient primary plasticizer—MONOPLEX 11

For upholstery, luggage, rainwear—for the many uses of free film—plasticize your stocks with MONOPLEX 11. This new, monomeric *primary* plasticizer shows such outstanding properties as:

1. *Very high efficiency.*
2. *Excellent compatibility with polyvinyl chloride, polyvinal butyral, Neoprene, and Buna N.*
3. *Compatibility with other monomeric and polymeric plasticizers.*
4. *Good dispersing properties.*
5. *Ease of emulsification for use with latices.*

Stocks plasticized with MONOPLEX 11 are characterized by excellent hand and drape; good low-temperature flexibility, ease of processing, and low fluxing temperature.

Particularly important, this outstanding primary plasticizer is available for prompt shipment in ample quantities.

If your product calls for softness, drape, heat permanence, and stability, investigate MONOPLEX 11. Write for full technical details.

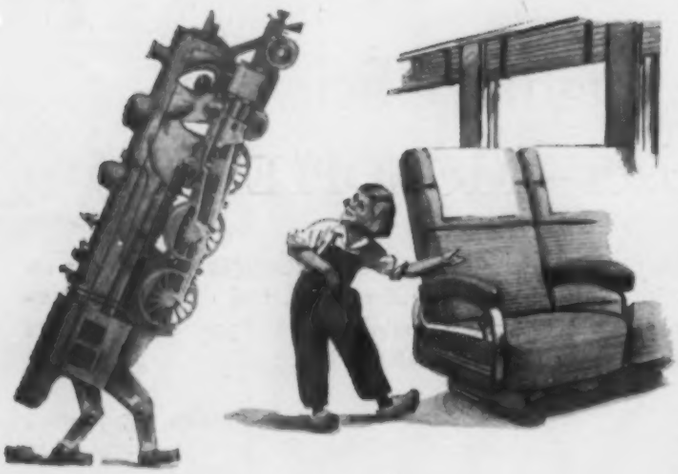
Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

From Tires for Planes

...to Seats for Trains



Dutch Boy: "To make a *good* rubber product a *better* rubber product . . . make it with Red Lead."

You: "I suppose you can back up that statement?"

Dutch Boy: "Sure I can. Practical manufacturing experience has borne out our research findings. It *proves* that compounding rubber with #2 RM Red Lead gives the seven advantages listed below."

You: "Don't the advantages depend on what product I'm making?"

Dutch Boy: "They do; for instance, if you make tires all seven advantages apply. But most of them are important with other products, too."

You: "Suppose my base is GR-S. Do they still apply?"

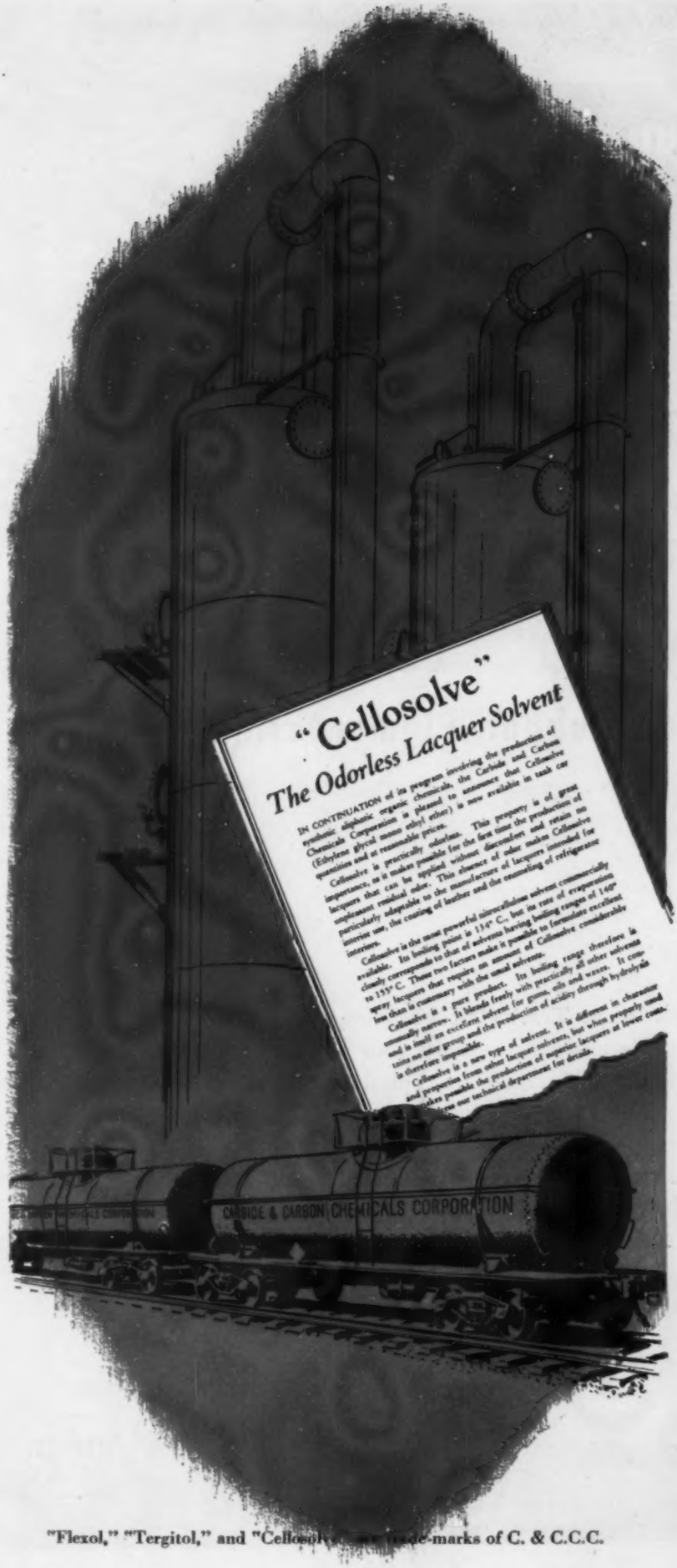
Dutch Boy: "Absolutely—GR-S, GR-S-10, GR-M, GR-A or GR-I. Just let us know your specific application and our technical staff will gladly supply literature and any other information you need. Drop a line to the Rubber Division of our Research Laboratories, 105 York Street, Brooklyn 1, New York."

COMPOUND RUBBER WITH #2 RM RED LEAD FOR 7 GOOD Rx REASONS

1. *Improved Heat Stability—Retention of Elasticity*
2. *Lower Heat Build-up—Cooler Running*
3. *Economical*
4. *Faster Curing Rate*
5. *Extended Curing Range*
6. *Excellent General Physical Properties*
7. *Safe Processing*

NATIONAL LEAD COMPANY—New York 6; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.); Charleston 25, West Virginia, (Evans Lead Division).

If it's made with RUBBER ... it's better made with Rx RED LEAD



"Cellosolve"—
20 years later

"Cellosolve" Solvent was a new chemical when the advertisement reproduced here appeared in 1927! This chemical, first successfully synthesized by Carbide, filled the long-standing need for a mild odored lacquer solvent. "Cellosolve" Solvent soon proved its usefulness in other applications as well. Today larger and larger quantities are used by many different industries.

This is but one instance of Carbide's continuing and successful synthesis and development of *useful* organic chemicals. Such pioneering has meant the growth, since 1920, from a pilot plant in Clendenin, West Virginia, to four large plants strategically located to serve an ever-growing demand for synthetic organic chemicals. This growth has been accompanied by the synthesis and introduction of whole new groups of chemicals now industrially important such as the glycols, glycol-ethers, the ethanolamines, the higher alcohols, "Flexol" plasticizers, and "Tergitol" wetting agents.

Our staff of chemically trained representatives is ready to help in applying synthetic organic chemicals to your product and process problems. When writing for information, please address Department N-6.

CARBIDE and CARBON CHEMICALS CORPORATION

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

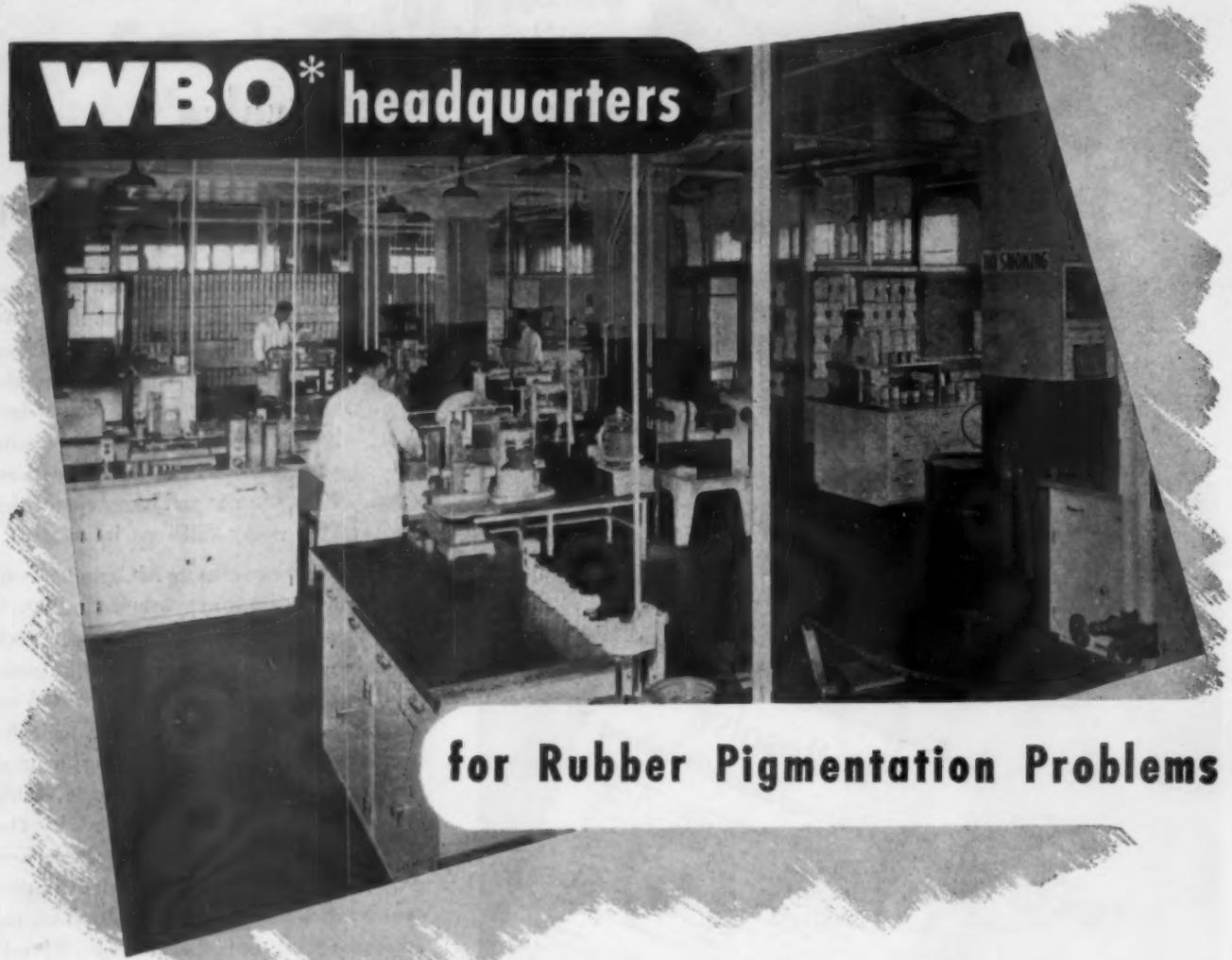
Offices in Principal Cities

In Canada:
Carbide and Carbon Chemicals, Limited, Toronto

"Flexol," "Tergitol," and "Cellosolve" are trade-marks of C. & C.C.C.

TITANOX . . . *the brightest name in titanium pigments*

WBO* headquarters



for Rubber Pigmentation Problems

When you order TITANOX pigments, you get more than the finest titanium dioxide pigments to make your rubber stock white, bright and opaque. You get an invaluable technical service, the kind that will help you produce better white or tinted rubber products which will be eye-catchers and sales-makers.

The skilled technicians on our Technical Service Laboratory staff will co-operate with you in solving pigmentation problems and creating formulas for your products.

Avail yourself of this free service by writing or phoning your nearest Titanium Pigment Corporation office today.

**whiteness, brightness, opacity*

TITANOX
TRADE MARK

TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT

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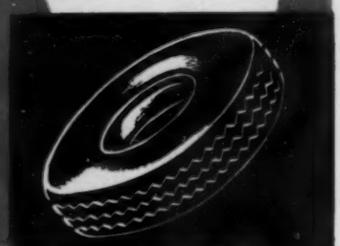
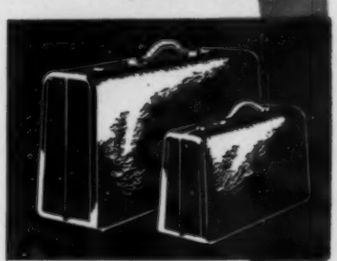
104 So. Michigan Ave., Chicago 3, Ill.
350 Townsend St., San Francisco 7, Cal.
2472 Enterprise St., Los Angeles 21, Cal.

Fountain of USE!

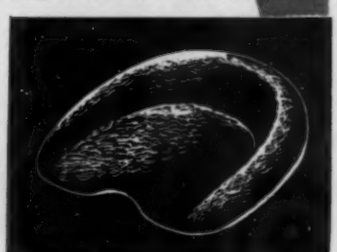
• Flintkote Saturants are widely used for fabric sizing, and in the Rug and Carpet industry to improve wear and appearance of the finished product.



• In tire manufacture, Flintkote [illegible] Solutioning for rayon and cotton [illegible] insures a firm, durable bond of [illegible] carcass...so important to tire life.



• New adhesives are replacing stitching, riveting and other old methods of fastening in many industries. Many luggage makers save time and money by assembling with Flintkote Industrial Adhesives.



• Flintkote Binder Compounds [illegible] help ing many fabricators speed up their production. Among the uses of such compounds are curled hair (above) and glass fibers.

● Out of Flintkote research flows new *utility* for elastomers. With it, come advantages in performance and *use* to manufacturers and processors.

Flintkote has applied research to many compounding problems. And, as a result, offers a wide line of rubbers, resins, latex compounds and asphalts, both as aqueous dispersions and solvent cements.

These materials...designed for standard or special requirements...are supplied either by drum or tank-car.

If some saturating, laminating or bonding requirement is giving you trouble, let us help. Our technical staff will be glad to work right along with you to formulate just what you need. Write us today.

FLINTKOTE

Products for Industry

FLINTKOTE INDUSTRIAL PRODUCTS

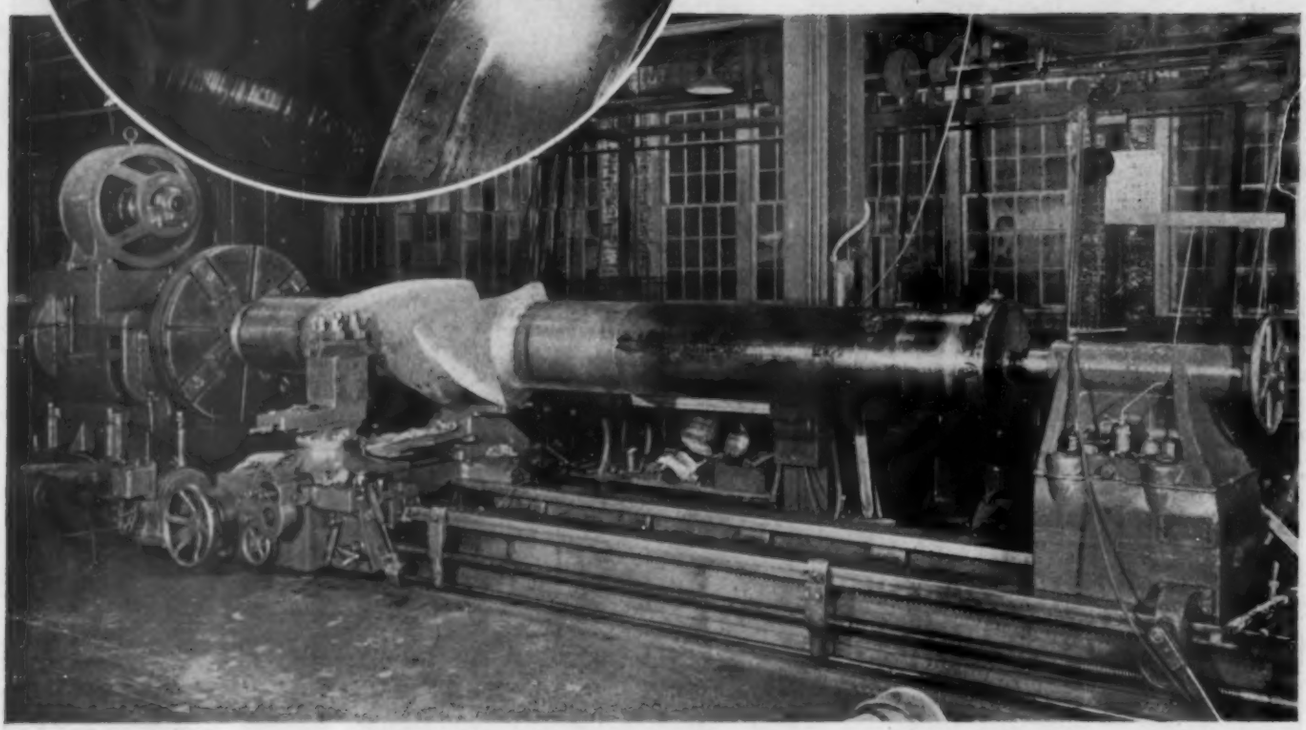
THE FLINTKOTE COMPANY, *Industrial Products Division*

30 Rockefeller Plaza, New York 20, N.Y. • Atlanta • Boston • Chicago Heights [illegible]

Always Available Here

This Five Point Rebuilding Service For Worn

BANBURY MIXERS



Grinding long No. 27 Rotor after hard-surfacing.

1. Correct contours restored to worn rotors. **2.** Rotors and mixing chamber made amazingly resistant to abrasion by our exclusive hard-surfacing process. **3.** Worn rings replaced by our own specially fabricated rings. **4.** New bearings, new oil tubes, packing, etc. **5.** Every job has the benefit of our more than a dozen years of specialized experince on this work.

For Quick Estimates on repairing or rebuilding YOUR worn Banburys just write, wire, or phone.

SERVING THE RUBBER INDUSTRY

IWS

INTERSTATE WELDING SERVICE

Main Plant: 914 Miami Street . . . AKRON, OHIO . . . Phone: JE 7970

EXCLUSIVE SPECIALISTS IN BANBURY MIXER REBUILDING

Coming right at you!

CONTINEX FF

. . . a brand-new, finely divided furnace black which can be substituted for equivalent amounts of channel black. Continex FF approaches channel black in particle size and retains the resistance to abrasive wear so necessary for many end-uses, especially tires.

Samples of this newly developed black are now available, on request, for evaluation by your technical staff.

WITCO CHEMICAL COMPANY

MANUFACTURERS AND EXPORTERS

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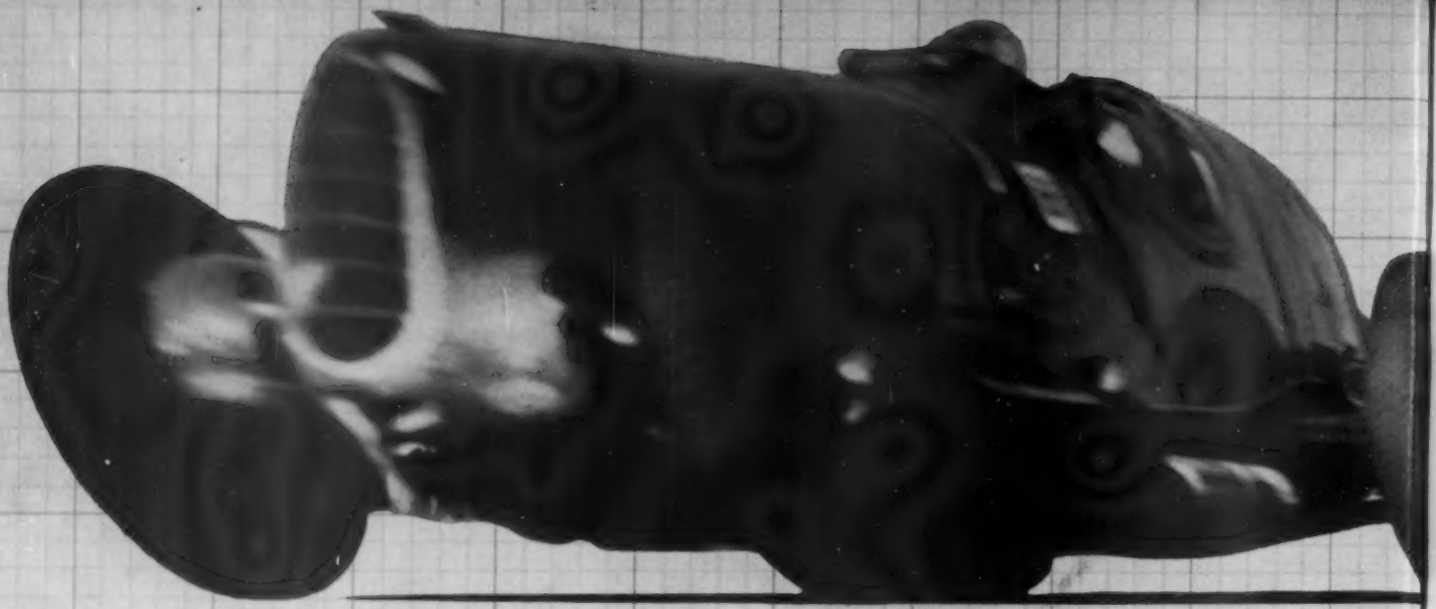
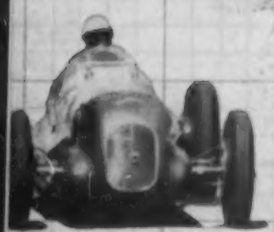
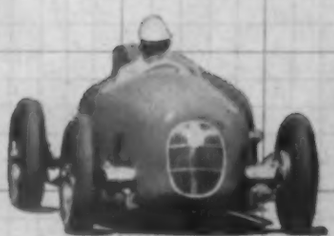
LOS ANGELES • BOSTON • CHICAGO
SAN FRANCISCO • AKRON

DETROIT • CLEVELAND
LONDON AND MANCHESTER, ENGLAND







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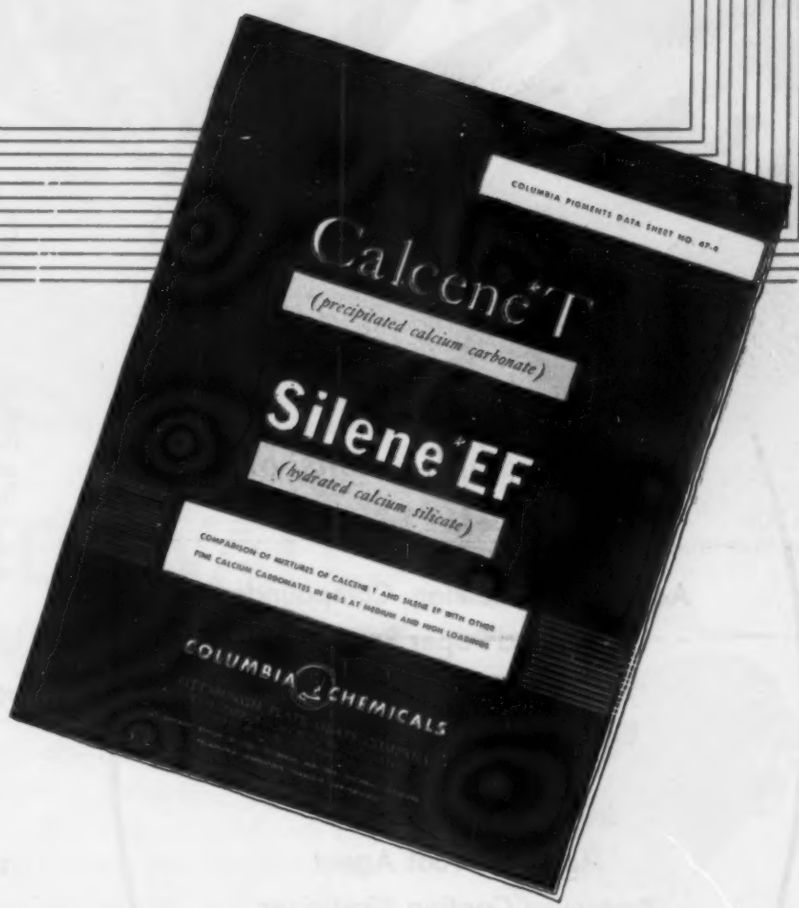
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Calcene T
(precipitated calcium carbonate)
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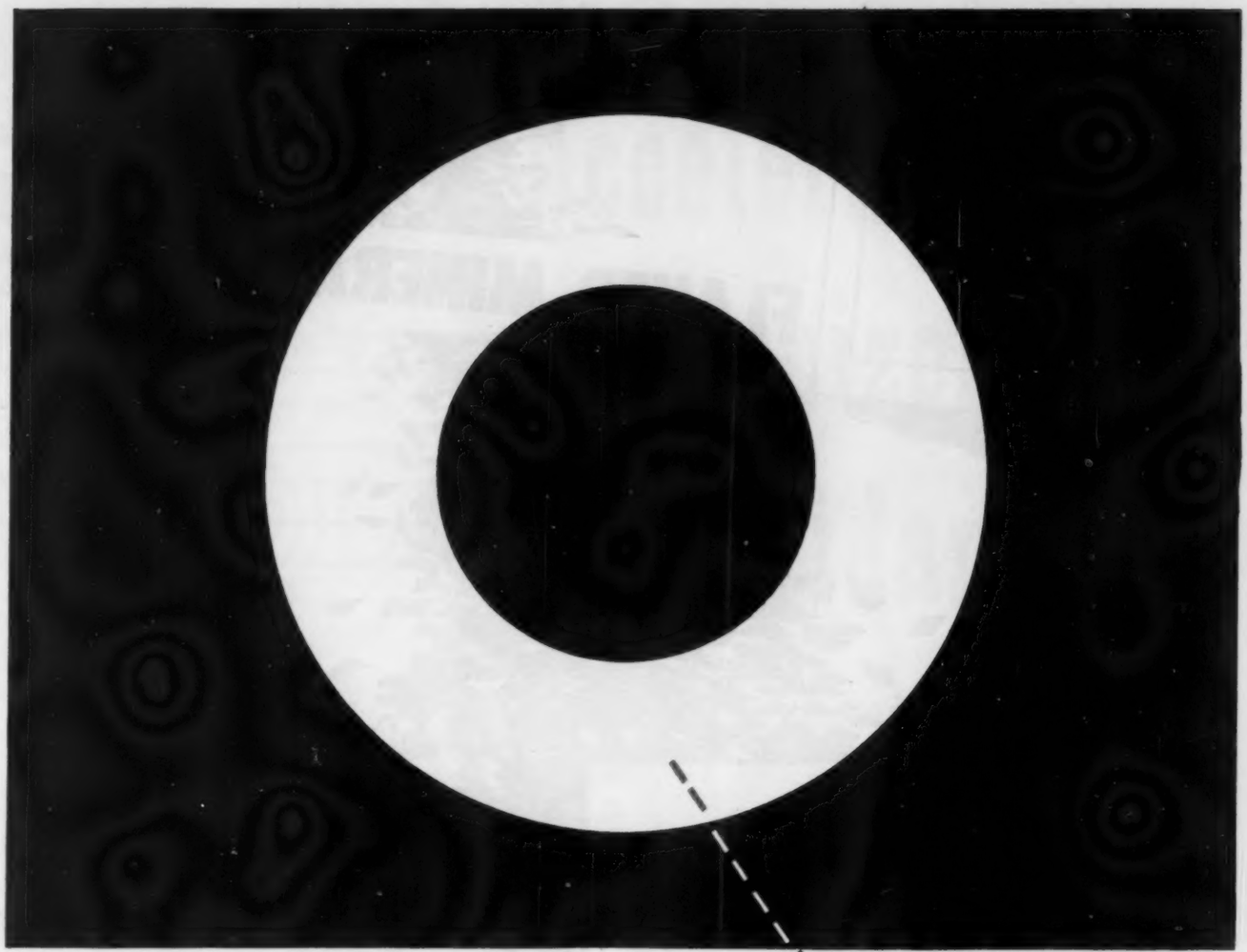

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GR-S-17 (formerly X-273) is a non-discoloring GR-S-10-type rubber shortstopped with sodium sulfide and stabilized with EFED. It offers, in addition to non-staining and non-discoloring properties, the generally better physical properties inherent in Rosin Rubber.

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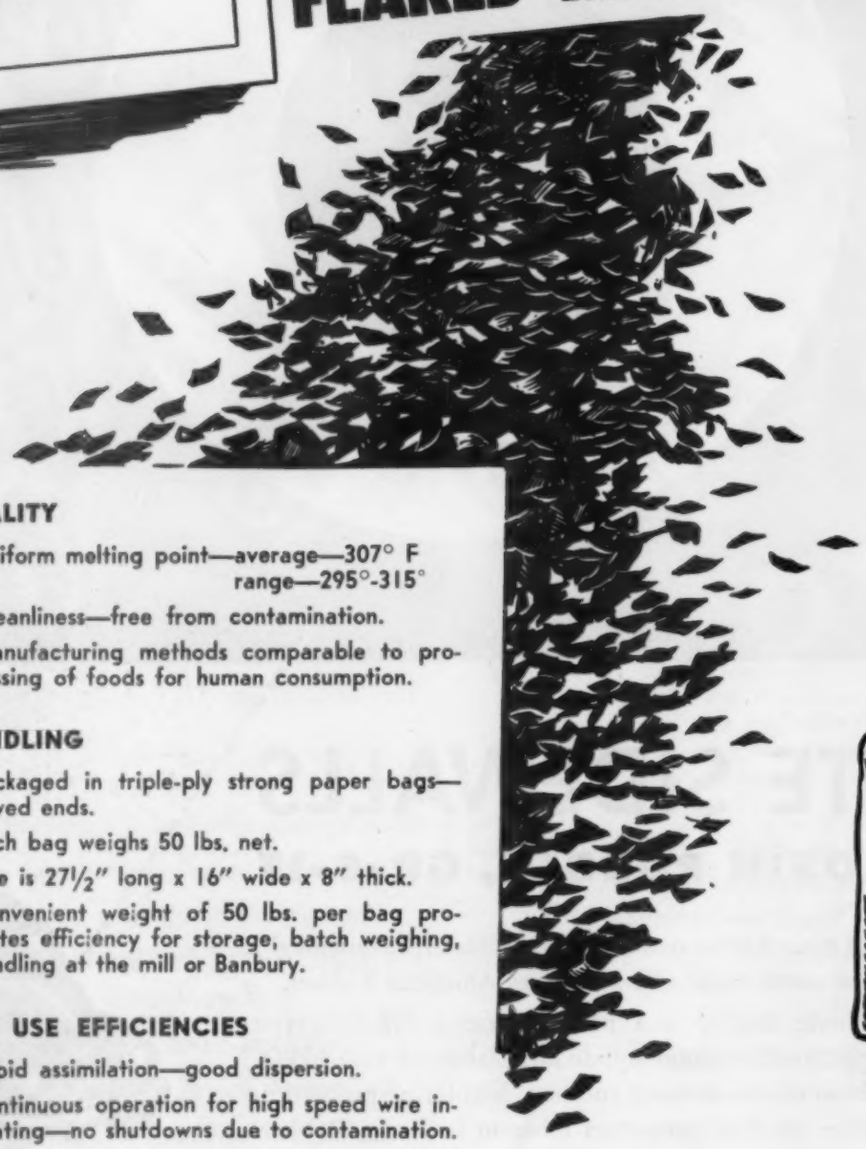

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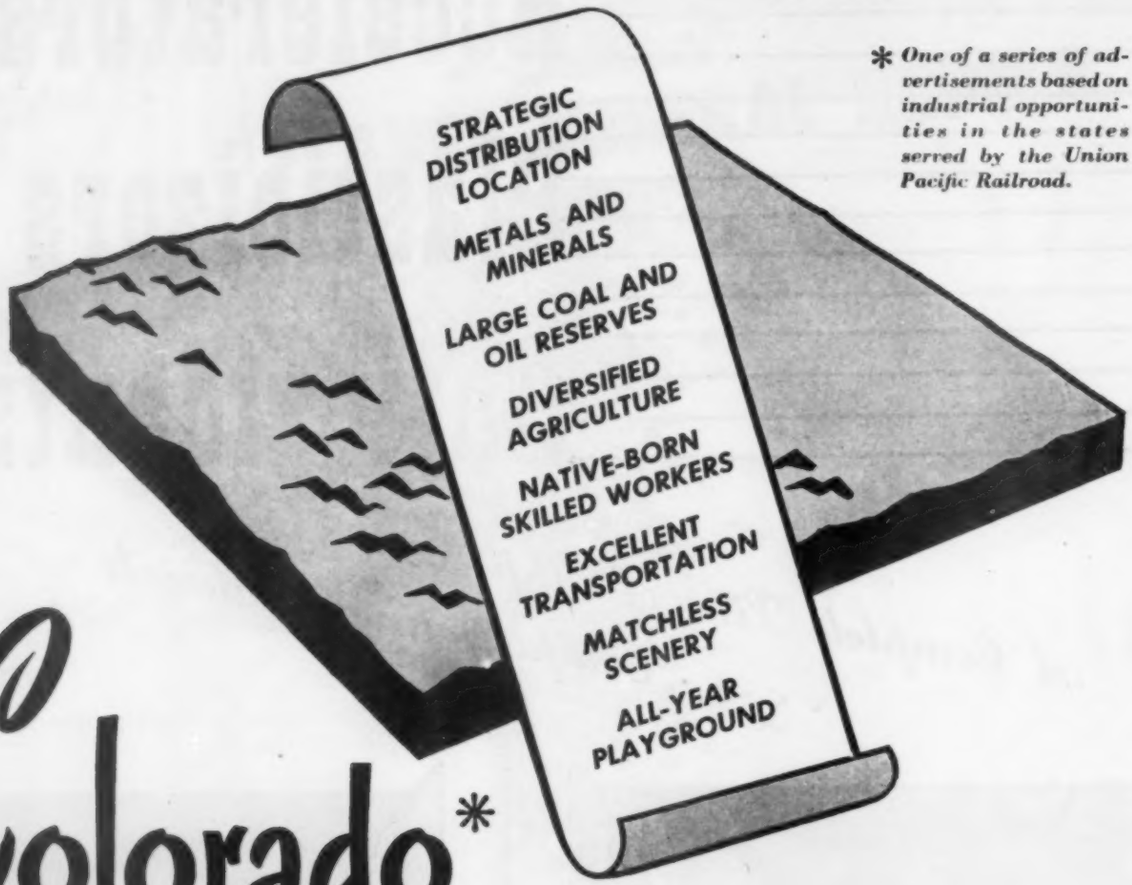

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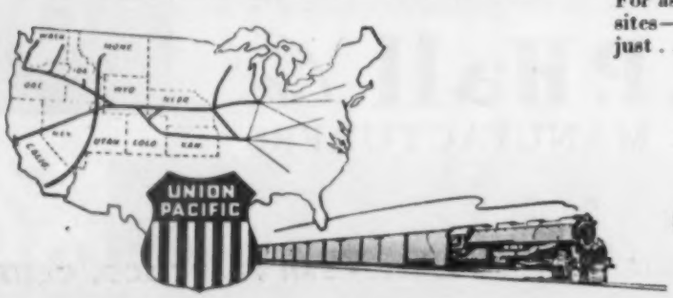

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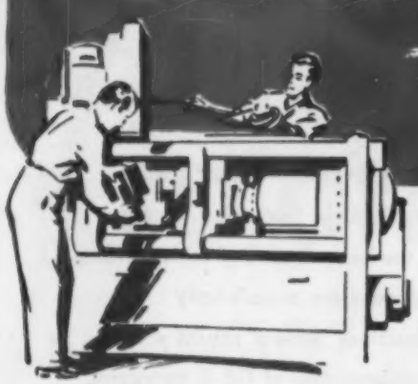

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Technical Bulletin No. 33 — on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

Heat Softened GR-S—X-349 with 100 Parts of Zinc Oxide

(Refer to Technical Bulletin No. 31.)

X-349 is defined by *Office of Rubber Reserve* as follows: "*A copolymer made with a limited amount of Dixie modifier fed increment wise. Because of its high Mooney, heat softening is required to obtain satisfactory processing; polymerization temperature and conversion lower than usual. Coagulated with salt and acetic acid. Similar to German Buna S-3. It is hoped that superior tread wear in tires made from this polymer will be exhibited.*"

COMPOUND NO. 33	
GR-S—X-349	100.0
Sulfur	3.25
MBT	1.25
DPG	0.15
Coumarone-indene Resin	7.5
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of: 200%	300%	400%	500%	Permanent Set	Shore Hardness	Tear Resistance Tested at: Room Temp.	100°C.
Without Heat Treatment—Mooney Plasticity-110										
4	1835	695	365	570	815	1020	.18	..	..	..
7.5	2340	660	425	655	925	1270	.18	53	129	48
15	2000	520	540	810	1150	1810	.16	55	91	46
30	2020	500	495	760	1220	2020	.16	58	98	44
45	1600	440	495	840	1260	....	.13	59	91	47
60	1540	430	500	810	1270	....	.11	59	85	39
90	1670	450	545	855	1360	....	.12	59	80	42
Heat Plasticized—Mooney Plasticity-55**										
4	2100	895	290	370	495	620	.34	..	..	..
7.5	2100	770	320	445	565	765	.28	51	100	47
15	1920	655	405	570	690	1060	.25	53	96	44
30	1630	575	490	655	855	1260	.20	55	90	43
45	1450	550	485	645	920	1330	.17	56	86	42
60	1755	550	490	735	935	1380	.19	56	86	44
90	1550	525	530	690	980	1470	.15	56	91	43

**Three periods of 4 hours each @ 110°C., 45 psi air pressure.

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum: Indentation in mm.	Per Cent Rebound	Hardness: Shore	Rex	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Final	Cut-Growth Resistance Tested at 70° C. Inches Failure: 1100 Cycles	Compounded Mooney Plasticity: After 1½ Min.
Without Heat Treatment—Mooney Plasticity-110											
60	7.47	69.3	59	62	22.4	15'-4.1	25.8	12.4	14.8	.66	116
Heat Plasticized—Mooney Plasticity-55**											
60	7.77	67.7	56	59	23.6	15'-4.8	22.6	13.8	16.0	.43	60

* Test Conditions: 143 Lb. Load. 0.175" Stroke. 100° C. Oven Temp.

X-349 with an original Mooney Plasticity of 110 would be difficult to process commercially. Heat treatment of three 4-hour periods at 110°C and 45 psi air pressure, brought the viscosity down to 55.

The heat treatment reduced tensiles only slightly and modulus moderately. Tear resistance was substantially unchanged. Rebound was lowered but heat generation improved. Cut-growth was slightly better.

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VOLUME 61

NUMBER 3

One of the World's Outstanding Rubber Journals

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RUBBER AGE

Vol. 61, No. 3 JUNE, 1947

Swelling of Rubber

V—Comparative Swelling of Vulcanized Natural Rubber and Synthetic Rubbers in Organic Liquids

By FRITZ S. ROSTLER and RICHARD M. WHITE

Engineering Experiment Station, University of Delaware, Newark, Delaware

INVESTIGATIONS have been carried out in this laboratory on the comparative swelling of GR-S and smoked sheets in a wide variety of organic liquids *(1,2,3)*. The purpose of the study reported in this paper was to extend these earlier investigations to representatives of all the principal types of rubbers in use by the rubber industry today. The work consisted in comparing the swelling behaviour of rubber compounds based on natural rubber, natural rubber reclaim, GR-S, GR-I (Butyl), GR-M (Neoprene GN), Hycar OR-25, Perbunan and Thiokol FA in representative organic liquids of the chemical types previously investigated with natural rubber and GR-S.

A considerable amount of data has been published in the literature on the swelling of the oil resistant polymers in various types of hydrocarbons and commercial petroleum products. Powers and Billmeyer *(4)*, for instance, have investigated the swelling of Neoprene GN, Perbunan, Hycar OR-15 and Thiokol FA in hydrocarbon oils and solvents in relation to the aniline point of the swelling liquids. Several studies have also been reported in which the swelling of various rubbers was investigated in organic liquids other than hydrocarbons *(5,6,7)*. The latest summary of investigations with pertinent literature references has been given by Marchionna *(8)*. Information on swelling behaviour of individual oil resistant rubbers is also to be found in the trade literature issued by the respective manufacturers *(9,10,11,12)*.

All these data provide very valuable information. However, a comparison of the figures from various studies is limited in accuracy not only by the use of different swelling conditions, but also by the use of test compounds of widely varied composition, containing different amounts and types of fillers and plasticizers. This latter limitation is also encountered within some of the individual investigations, so that the figures reported, even if calculated on a basis of swelling of the rubber hydrocarbons, are not strictly comparable. It has been shown that the presence of a reinforcing filler, such as carbon black, reduces the swelling of a rubber compound more than can be accounted for by dilution of the rubber content. A study carried out in this laboratory has shown that swelling figures expressed as per cent swelling of rubber hydrocarbons vary between compounds loaded with the same volume of different carbon blacks *(13)*.

The present study is intended to supplement and correlate the information which is to be found in the literature by providing strictly comparative data on the

TABLE I—SWELLING LIQUIDS

Designation	*Type*	*Grade or Trade Name*	*Source*
Low Mol. Wt. Liquids:			
n-Heptane	Saturated aliphatic hydrocarbon	Pure	Westvaco Chlorine Products Corp.
Caprylene (n-octene-2)	Unsaturated aliphatic hydrocarbon	Pure	Eastman Kodak Co.
Cyclohexane	Saturated alicyclic hydrocarbon	Technical	Phillips Petroleum Co.
Benzene	Aromatic hydrocarbon	Purified 99-100%	J. T. Baker Chemical Co.
Turpentine (essentially α-pinene)	Cyclic terpene hydrocarbon	Steam distilled wood turpentine	Hercules Powder Co.
Acetone	Ketone	Technical	Eastman Kodak Co.
Hexyl alcohol	Alcohol	Practical	Eastman Kodak Co.
Ethyl ether	Ether	U.S.P.	Mallinckrodt Chemical Works
Ethyl acetate	Ester	Analytical reagent	Mallinckrodt Chemical Works
Ethylene chloride	Chlorine compound	Pure	Eastman Kodak Co.
Aniline	Amine	C.P.	J. T. Baker Chemical Co.
Carbon disulfide	Sulfur compound	Freshly redistilled	
Petroleum Oils:			
White oil	Paraffinic oil	"Atlantic Stabilized 85 White Oil"	Atlantic Refining Co.
Unsaturated oil	Unsaturated cyclic hydrocarbon oil	"Wilcor Reclaiming Oil 111"	Wilmington Chemical Corp.
Mixed Liquids: (Composition by volume)			
15% aniline: 85% unsat. oil	Unsaturated cyclic hydrocarbon oil plus amine	.....	.....
20% aniline: 80% unsat. oil			
35% aniline: 65% unsat. oil			
50% aniline: 50% unsat. oil			
80% aniline: 20% unsat. oil			

swelling behaviour of the most commonly used rubbers, and to determine whether the swelling behaviour of rubbers in organic liquids conforms to some general pattern. To this end the swelling behaviour of the rubbers under investigation was studied under identical conditions in representatives of liquids of a wide range of chemical types.

To make the data directly comparable, vulcanized test compounds were prepared which contained on a volume basis the same amount of one filler, and which contained no plasticizer or other material which would be extractable by the swelling liquid to an uncertain extent.* In addition, all the rubbers were cured with the same sulfur and accelerator combination, except for the neoprene and Thiokol, which require special curing agents.

* The data measured on the test compound based on whole tire reclaim, which contains filler to start with, are, of course, not quantitatively comparable with the data obtained on the other compounds, but have been included for practical purposes.

Scope of Investigation

The liquids used in the investigation included a series of low molecular weight organic liquids, two relatively heavy petroleum hydrocarbon materials, one a saturated and one an unsaturated petroleum oil, and, in addition, various mixtures of aniline with the unsaturated oil. The low molecular weight liquids were chosen to be representative of the types of liquids previously investigated as to their swelling action on GR-S and natural rubber *(2)*. As representatives of petroleum oils were chosen a commercial white oil and an un-

TABLE II—TEST COMPOUNDS

	Butyl	Smoked Sheets	GR-S	Neoprene	Hycar	Perbunan	Thiokol	Reclaim
GR-I (Butyl)	100.	.....	.....	.....	.....	.....	.....	.....
Smoked sheets	.....	100.	.....	.....	.....	.....	.....	.....
GR-S	.....	.....	100.	.....	.....	.....	.....	.....
GR-M (Neoprene GN)	.....	.....	.....	125.	.....	.....	.....	.....
Hycar OR-25	.....	.....	.....	.....	100.	.....	.....	.....
Perbunan	.....	.....	.....	.....	.....	100.	.....	.....
Thiokol FA	.....	.....	.....	.....	.....	.....	135.	.....
Whole tire reclaim (50% RHC)	.....	.....	.....	.....	.....	.....	.....	200.
Stearic acid	1.	1.	1.	1.	1.	1.	1.	1.
Sulfur	2.	2.	2.	.....	2.	2.	.....	2.
Zinc oxide	5.	5.	5.	5.	5.	5.	13.	5.
Pelletex	45.	45.	45.	45.	45.	45.	45.	45.
Benzothiazyl disulfide	1.50	1.50	1.50	.....	1.50	1.50	0.40	1.50
Diphenylguanidine	0.25	0.25	0.25	.....	0.25	0.25	0.15	0.25
Magnesia, extra light	.....	.....	.....	5.0	.....	.....	.....	.....
Cure—Temperature (°C.)	153	145	145	145	145	145	145	145
—Time (mins.)	65	50	50	50	50	50	65	50
Shore hardness— 5 seconds	54	60	62	67	66	64	61	69
—30 seconds	48	58	60	65	64	61	57	64
300% modulus (psi)	260	1500	1540	2100	1940	1640	650	.....
500% modulus (psi)	590	.....	.....	.....	.....	.....	1100	.....
Tensile at break (psi)	1760	2840	1890	2820	2420	1890	1200	1050
Elongation at break (%)	800	460	360	450	360	340	530	280
Set at break (%)	37	17	9	6	5	9	20	16

saturated petroleum oil used commercially as a reclaiming oil.

The chemical types represented, and the particular swelling liquid used, are listed in Table I. The composition of the test compounds used and their physical properties are given in Table II.

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The test compounds were mixed and cured according to the A.S.T.M. method of sample preparation for physical testing of rubber compounds *(14)*. The physical test data reported in Table II were also measured according to A.S.T.M. methods *(15,16)*.

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Measurement of volume of the test specimen before and after swelling was made by displacement of a dilute sodium oleate solution in a cylinder equipped with a calibrated inclined side arm. The apparatus and test method have been described earlier *(1)*.

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Relation of Swelling to Structure

The swelling behaviour of each of the rubbers in each of the liquids is summarized graphically in Figure 1. In this figure are given the results of the tests at 25°C. in the low molecular weight liquids, and of the tests at 60°C. in the two petroleum oils. The dark portion of the bars in this chart represents the swelling maximum as defined by Scott *(17)*, that is, the figure obtained by extrapolating the latter straight portion of the time swelling curve back to zero time. The total height of the bar represents the swelling after 2 weeks' immersion. The unshaded portion is therefore an indication of the swelling increment *(17)*, the slow and continuous swelling of the rubber sample in the liquid which continued after the initial rapid swelling was complete. Where there is no unshaded portion in the bar, the rubber had reached a constant volume in the

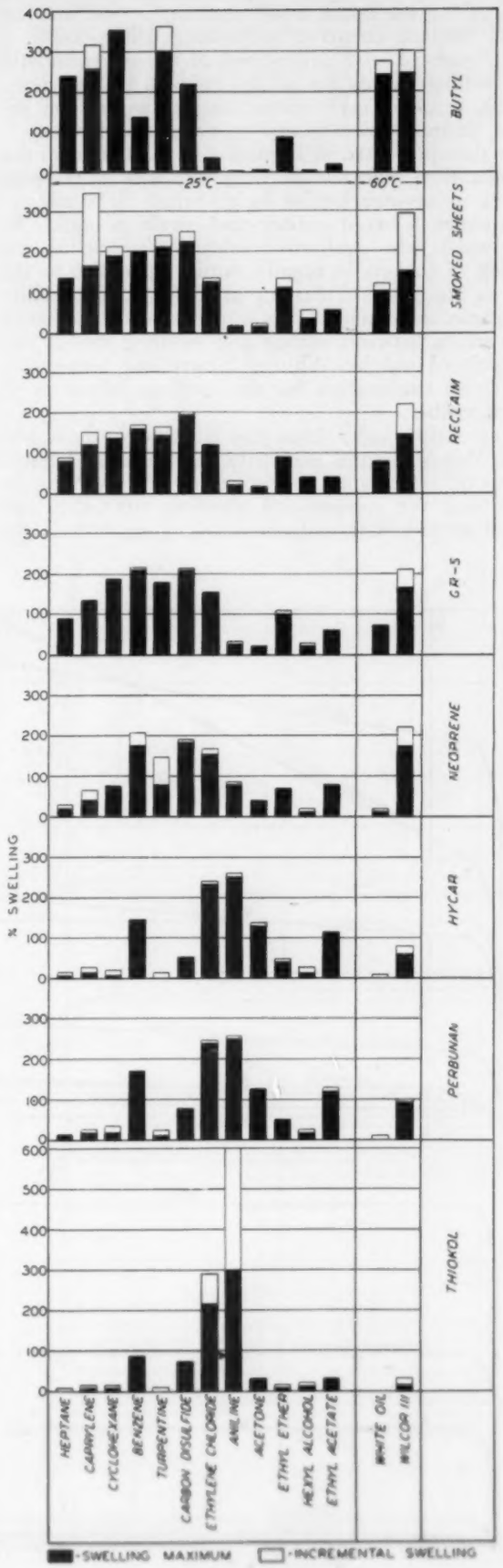

FIG. 1—Summary graph of swelling behaviour.

Rubber Industry Employment, Payrolls, Wages and Hours

Employment — Thousands of Production Workers and Index (1939 = 100)

Month	1945 All Rubber Products Number	1945 All Rubber Products Index	1945 Rubber Tires & Tubes Number	1945 Rubber Tires & Tubes Index	1946 All Rubber Products Number	1946 All Rubber Products Index	1946 Rubber Tires & Tubes Number	1946 Rubber Tires & Tubes Index
Jan.	199	164.9	97	178.5	209	172.7	99	182.4
Feb.	200	165.1	96	178.0	214	177.1	101	187.3
Mar.	209	173.2	96	176.8	220	181.5	104	191.6
Apr.	205	169.6	93	172.2	220	182.0	104	192.8
May	201	166.6	92	169.2	221	182.7	105	193.4
June	199	164.5	90	166.7	225	186.1	106	195.8
July	194	160.5	88	162.1	218	180.2	99	183.1
Aug.	191	158.0	86	159.3	227	187.5	103	189.9
Sept.	165	136.5	72	132.7	233	192.8	107	197.0
Oct.	187	154.4	88	163.0	240	198.7	110	204.0
Nov.	194	160.1	91	168.9	245	202.9	112	207.0
Dec.	203	168.2	96	177.8	248	204.7	112	207.2

Payrolls — Production Workers Pay Rolls Unadjusted Index (1939 = 100)

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	291.0	288.9	323.2	342.4	290.1	272.6
Feb.	295.7	295.6	323.6	339.8	292.1	271.9
Mar.	297.0	299.3	315.4	301.9	302.8	281.1
Apr.	281.3	280.0	315.9	306.0	324.9	312.9
May	283.3	283.0	299.8	288.6	327.6	314.2
June	281.4	278.5	304.3	293.8	337.2	318.3
July	279.7	280.9	298.7	286.8	327.2	304.3
Aug.	291.0	294.3	265.7	249.7	343.2	311.2
Sept.	294.5	300.8	231.3	211.4	370.9	348.9
Oct.	293.3	297.5	254.2	239.8	368.5	346.1
Nov.	293.6	298.2	257.8	240.2	385.1	360.3
Dec.	308.5	319.4	275.5	256.7	402.3	371.5

Wages — Average Weekly Earnings

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	$48.18	$55.79	$54.49	$64.29	$46.71	$50.29
Feb.	48.95	57.21	54.40	64.04	46.05	49.21
Mar.	49.53	58.38	50.62	57.29	46.46	49.72
Apr.	48.12	55.63	51.93	59.75	49.67	54.77
May	48.98	57.11	50.09	57.32	49.82	54.72
June	49.30	56.78	51.45	59.20	50.45	54.82
July	49.17	57.01	51.81	59.59	50.60	56.11
Aug.	50.24	58.62	46.76	52.81	51.03	55.42
Sept.	50.99	59.33	47.20	53.59	53.69	59.89
Oct.	50.92	58.54	45.57	49.48	51.74	57.38
Nov.	50.59	58.30	44.68	47.78	52.98	58.87
Dec.	52.64	61.62	45.48	48.54	54.73	60.55

Wages — Average Hourly Earnings

Month	1944 All Rubber Products	1944 Rubber Tires & Tubes	1945 All Rubber Products	1945 Rubber Tires & Tubes	1946 All Rubber Products	1946 Rubber Tires & Tubes
Jan.	$1.066	$1.224	$1.151	$1.317	$1.121	$1.255
Feb.	1.072	1.240	1.149	1.314	1.129	1.266
Mar.	1.086	1.256	1.117	1.260	1.138	1.275
Apr.	1.075	1.234	1.136	1.294	1.232	1.414
May	1.087	1.257	1.132	1.284	1.266	1.446
June	1.092	1.254	1.140	1.307	1.283	1.461
July	1.094	1.256	1.138	1.296	1.292	1.472
Aug.	1.102	1.264	1.119	1.269	1.295	1.474
Sept.	1.117	1.273	1.098	1.243	1.323	1.507
Oct.	1.108	1.263	1.100	1.231	1.313	1.492
Nov.	1.107	1.258	1.112	1.249	1.322	1.503
Dec.	1.130	1.290	1.113	1.247	1.330	1.509

Hours — Average Weekly Hours per Worker

Month	1944	1945	1946	Month	1944	1945	1946
January	45.2	47.3	41.7	July	45.0	45.5	39.2
February	45.7	47.3	40.8	August	45.6	41.8	39.4
March	45.6	45.3	40.8	September	45.7	43.0	40.6
April	44.7	45.7	40.3	October	45.9	41.4	39.4
May	45.1	44.2	39.4	November	45.7	40.2	40.1
June	45.2	45.2	39.3	December	46.6	40.9	41.2

Source: U. S. Department of Commerce.

Indexes of Production, Shipments and Inventory For The Rubber Industry

Production 1935-1939 = 100 (Based on man-hours)

Month	1944	1945	1946	Month	1944	1945	1946
Jan.	242	247	215	July	227	218	211
Feb.	244	247	216	Aug.	231	193	221
Mar.	242	236	221	Sept.	230	172	234
Apr.	231	233	219	Oct.	231	191	234
May	230	224	215	Nov.	231	192	243
June	228	222	218	Dec.	239	205	252

Shipments—Average Month 1939 = 100 (Based on $ Value)

Jan.	274	311	229	July	295	274	268
Feb.	299	351	242	Aug.	288	255	282
Mar.	290	351	260	Sept.	297	200	311
Apr.	295	356	282	Oct.	342	260	333
May	293	333	288	Nov.	293	212	313
June	316	333	293	Dec.	341	292	352

Inventory — Average Month 1939 = 100 (Based on $ Value)

Jan.	179.6	170.6	173.7	July	174.7	183.3	195.0
Feb.	185.2	176.7	179.9	Aug.	172.9	182.4	198.0
Mar.	187.6	175.5	186.4	Sept.	174.3	177.4	204.0
Apr.	190.6	175.3	198.5	Oct.	174.3	167.7	212.0
May	188.1	178.3	195.5	Nov.	176.1	167.1	215.0
June	182.1	178.7	192.4	Dec.	169.6	169.0	216.0

Source: U. S. Department of Commerce.

Various Compounding Materials Consumed by the Rubber Industry

Material	1939	1940	1941	1942	1943	1944	1945
Asphalt [a]							
Short tons	24,293	22,772	20,536	22,263	16,510	20,189	19,481
% of total	1.0	0.9	0.6	0.6	0.5	0.6	0.5
Barite (Barytes):							
Short tons	3,319	4,283	9,800	6,334	8,000	10,000	10,000
% of total	2.0	2.3	4.2	3.6	3.9	2.9	2.1
Carbon Black:							
Short tons	158,311	155,090	219,751	147,974	236,737	369,015	402,193
% of total	56.5	58.5	68.2	65.8	75.2	78.7	78.9
Clay, Kaolin:							
Short tons	90,287	92,640	127,055	51,334	50,964	59,588	109,936
% of total	11.6	11.1	11.6	5.1	5.5	6.8	11.7
Clay, Fire & Stoneware:							
Short tons	3,770	10,104	9,000	5,000	10,259	7,160	7,800
% of total	0.2	0.4	0.2	0.1	0.2	0.1	0.1
Lead Sulfate, Basic:							
Short tons	140	128	200	89	131	268	200
% of total	2.5	2.1	1.9	1.1	2.3	4.2	3.2
Lime:							
Short tons	1,357	1,879	3,058	1,381	2,039	5,634	7,170
% of total	0.03	0.03	0.05	0.02	0.05	0.13	0.10
Litharge:							
Short tons	1,404	1,590	3,968	3,460	4,302	3,023	1,864
% of total	1.6	1.8	3.3	3.8	3.8	2.2	1.3
Lithopone:							
Short tons	3,189	3,387	3,547	1,047	1,078	726	977
% of total	2.2	2.2	2.0	0.8	0.8	0.5	0.7
Mica, Ground:							
Short tons	2,539	1,731	3,476	1,754	3,063	1,137	3,715
% of total	8.2	6.2	8.0	3.7	6.0	2.2	7.0
Sulfur:							
Short tons	49,000	54,000	63,000	40,000	51,000	63,000	64,960
% of total	2.5	2.5	2.4	1.4	1.8	1.9	2.0
Talc [b]							
Short tons	31,078	28,501	58,114	40,487	48,994	51,833	62,049
% of total	12.4	10.0	13.9	10.0	11.8	13.0	15.0
Zinc Oxide:							
Short tons	70,187	70,979	90,429	52,717	67,898	59,518	63,447
% of total	61.3	62.8	63.4	53.0	47.4	42.3	49.6

Source: U. S. Bureau of Mines.

Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes pyrophyllite and ground soapstone.

RUBBER AGE

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Swelling of Rubber

V—Comparative Swelling of Vulcanized Natural Rubber and Synthetic Rubbers in Organic Liquids

By FRITZ S. ROSTLER and RICHARD M. WHITE

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INVESTIGATIONS have been carried out in this laboratory on the comparative swelling of GR-S and smoked sheets in a wide variety of organic liquids *(1,2,3)*. The purpose of the study reported in this paper was to extend these earlier investigations to representatives of all the principal types of rubbers in use by the rubber industry today. The work consisted in comparing the swelling behaviour of rubber compounds based on natural rubber, natural rubber reclaim, GR-S, GR-I (Butyl), GR-M (Neoprene GN), Hycar OR-25, Perbunan and Thiokol FA in representative organic liquids of the chemical types previously investigated with natural rubber and GR-S.

A considerable amount of data has been published in the literature on the swelling of the oil resistant polymers in various types of hydrocarbons and commercial petroleum products. Powers and Billmeyer *(4)*, for instance, have investigated the swelling of Neoprene GN, Perbunan, Hycar OR-15 and Thiokol FA in hydrocarbon oils and solvents in relation to the aniline point of the swelling liquids. Several studies have also been reported in which the swelling of various rubbers was investigated in organic liquids other than hydrocarbons *(5,6,7)*. The latest summary of investigations with pertinent literature references has been given by Marchionna *(8)*. Information on swelling behaviour of individual oil resistant rubbers is also to be found in the trade literature issued by the respective manufacturers *(9,10,11,12)*.

All these data provide very valuable information. However, a comparison of the figures from various studies is limited in accuracy not only by the use of different swelling conditions, but also by the use of test compounds of widely varied composition, containing different amounts and types of fillers and plasticizers. This latter limitation is also encountered within some of the individual investigations, so that the figures reported, even if calculated on a basis of swelling of the rubber hydrocarbons, are not strictly comparable. It has been shown that the presence of a reinforcing filler, such as carbon black, reduces the swelling of a rubber compound more than can be accounted for by dilution of the rubber content. A study carried out in this laboratory has shown that swelling figures expressed as per cent swelling of rubber hydrocarbons vary between compounds loaded with the same volume of different carbon blacks *(13)*.

The present study is intended to supplement and correlate the information which is to be found in the literature by providing strictly comparative data on the

TABLE I—SWELLING LIQUIDS

Designation	*Type*	*Grade or Trade Name*	*Source*
Low Mol. Wt. Liquids:			
n-Heptane	Saturated aliphatic hydrocarbon	Pure	Westvaco Chlorine Products Corp.
Caprylene (n-octene-2)	Unsaturated aliphatic hydrocarbon	Pure	Eastman Kodak Co.
Cyclohexane	Saturated alicyclic hydrocarbon	Technical	Phillips Petroleum Co.
Benzene	Aromatic hydrocarbon	Purified 99-100%	J. T. Baker Chemical Co.
Turpentine (essentially α-pinene)	Cyclic terpene hydrocarbon	Steam distilled wood turpentine	Hercules Powder Co.
Acetone	Ketone	Technical	Eastman Kodak Co.
Hexyl alcohol	Alcohol	Practical	Eastman Kodak Co.
Ethyl ether	Ether	U.S.P.	Mallinckrodt Chemical Works
Ethyl acetate	Ester	Analytical reagent	Mallinckrodt Chemical Works
Ethylene chloride	Chlorine compound	Pure	Eastman Kodak Co.
Aniline	Amine	C.P.	J. T. Baker Chemical Co.
Carbon disulfide	Sulfur compound	Freshly redistilled	
Petroleum Oils:			
White oil	Paraffinic oil	"Atlantic Stabilized 85 White Oil"	Atlantic Refining Co.
Unsaturated oil	Unsaturated cyclic hydrocarbon oil	"Wilcor Reclaiming Oil 111"	Wilmington Chemical Corp.
Mixed Liquids: (Composition by volume)			
15% aniline: 85% unsat. oil	Unsaturated cyclic hydrocarbon oil plus amine	.....	.....
20% aniline: 80% unsat. oil			
35% aniline: 65% unsat. oil			
50% aniline: 50% unsat. oil			
80% aniline: 20% unsat. oil			

swelling behaviour of the most commonly used rubbers, and to determine whether the swelling behaviour of rubbers in organic liquids conforms to some general pattern. To this end the swelling behaviour of the rubbers under investigation was studied under identical conditions in representatives of liquids of a wide range of chemical types.

To make the data directly comparable, vulcanized test compounds were prepared which contained on a volume basis the same amount of one filler, and which contained no plasticizer or other material which would be extractable by the swelling liquid to an uncertain extent.* In addition, all the rubbers were cured with the same sulfur and accelerator combination, except for the neoprene and Thiokol, which require special curing agents.

* The data measured on the test compound based on whole tire reclaim, which contains filler to start with, are, of course, not quantitatively comparable with the data obtained on the other compounds, but have been included for practical purposes.

Scope of Investigation

The liquids used in the investigation included a series of low molecular weight organic liquids, two relatively heavy petroleum hydrocarbon materials, one a saturated and one an unsaturated petroleum oil, and, in addition, various mixtures of aniline with the unsaturated oil. The low molecular weight liquids were chosen to be representative of the types of liquids previously investigated as to their swelling action on GR-S and natural rubber *(2)*. As representatives of petroleum oils were chosen a commercial white oil and an un-

TABLE II—TEST COMPOUNDS

	Butyl	Smoked Sheets	GR-S	Neoprene	Hycar	Perbunan	Thiokol	Reclaim
GR-I (Butyl)	100.	.....	.....	.....	.....	.....	.....	.....
Smoked sheets	.....	100.	.....	.....	.....	.....	.....	.....
GR-S	.....	.....	100.	.....	.....	.....	.....	.....
GR-M (Neoprene GN)	.....	.....	.....	125.	.....	.....	.....	.....
Hycar OR-25	.....	.....	.....	.....	100.	.....	.....	.....
Perbunan	.....	.....	.....	.....	.....	100.	.....	.....
Thiokol FA	.....	.....	.....	.....	.....	.....	135.	.....
Whole tire reclaim (50% RHC)	.....	.....	.....	.....	.....	.....	.....	200.
Stearic acid	1.	1.	1.	1.	1.	1.	1.	1.
Sulfur	2.	2.	2.	.....	2.	2.	.....	2.
Zinc oxide	5.	5.	5.	5.	5.	5.	13.	5.
Pelletex	45.	45.	45.	45.	45.	45.	45.	45.
Benzothiazyl disulfide	1.50	1.50	1.50	.....	1.50	1.50	0.40	1.50
Diphenylguanidine	0.25	0.25	0.25	.....	0.25	0.25	0.15	0.25
Magnesia, extra light	.....	.....	.....	5.0	.....	.....	.....	.....
Cure—Temperature (°C.)	153	145	145	145	145	145	145	145
—Time (mins.)	65	50	50	50	50	50	65	50
Shore hardness— 5 seconds	54	60	62	67	66	64	61	69
—30 seconds	48	58	60	65	64	61	57	64
300% modulus (psi)	260	1500	1540	2100	1940	1640	650	.....
500% modulus (psi)	590	.....	.....	.....	.....	.....	1100	.....
Tensile at break (psi)	1760	2840	1890	2820	2420	1890	1200	1050
Elongation at break (%)	800	460	360	450	360	340	530	280
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saturated petroleum oil used commercially as a reclaiming oil.

The chemical types represented, and the particular swelling liquid used, are listed in Table I. The composition of the test compounds used and their physical properties are given in Table II.

Specimens of these compounds were tested in the low molecular weight liquids at room temperature (25°C.), and in the petroleum oils at 60°C. All the compounds with the exception of the Butyl compound were also tested in the two petroleum oils at a considerably elevated temperature (175°C.) in order to have an indication of the swelling increment and of disintegration of the rubber in the oil. Further tests, again with the exception of the Butyl compound, were made at 120°C. in Wilcor 111, in aniline, and in mixtures of the unsaturated oil with aniline, to measure the swelling effect of combinations of the hydrocarbon oil with a polar liquid.

Experimental Procedure

The test compounds were mixed and cured according to the A.S.T.M. method of sample preparation for physical testing of rubber compounds *(14)*. The physical test data reported in Table II were also measured according to A.S.T.M. methods *(15,16)*.

Swelling measurements were made in all cases on duplicate samples. In the swelling tests at the two lower temperatures (25°C. and 60°C.) samples were removed from the liquid for measurement after 1, 2, 3, 7 and 14 days, and reimmersed after measuring for further swelling. In the tests at the higher temperatures (120°C. and 175°C.) separate pairs of samples were used for each test period.

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The test specimens had approximate original dimensions of 4.5 x 2 x 0.2 cm., and were cut from A.S.T.M. test slabs. Swelling tests were carried out by immersing the samples in test tubes of 35 mm. inside diameter, containing approximately 120 cc. of the swelling liquid. For tests at 60°C., 120°C. and 175°C., the tubes were placed in a constant temperature bath and brought to temperature before immersing the samples. The bath was equipped with a thermoregulator maintaining the temperature constant within ±1°C.

Relation of Swelling to Structure

The swelling behaviour of each of the rubbers in each of the liquids is summarized graphically in Figure 1. In this figure are given the results of the tests at 25°C. in the low molecular weight liquids, and of the tests at 60°C. in the two petroleum oils. The dark portion of the bars in this chart represents the swelling maximum as defined by Scott *(17)*, that is, the figure obtained by extrapolating the latter straight portion of the time swelling curve back to zero time. The total height of the bar represents the swelling after 2 weeks' immersion. The unshaded portion is therefore an indication of the swelling increment *(17)*, the slow and continuous swelling of the rubber sample in the liquid which continued after the initial rapid swelling was complete. Where there is no unshaded portion in the bar, the rubber had reached a constant volume in the

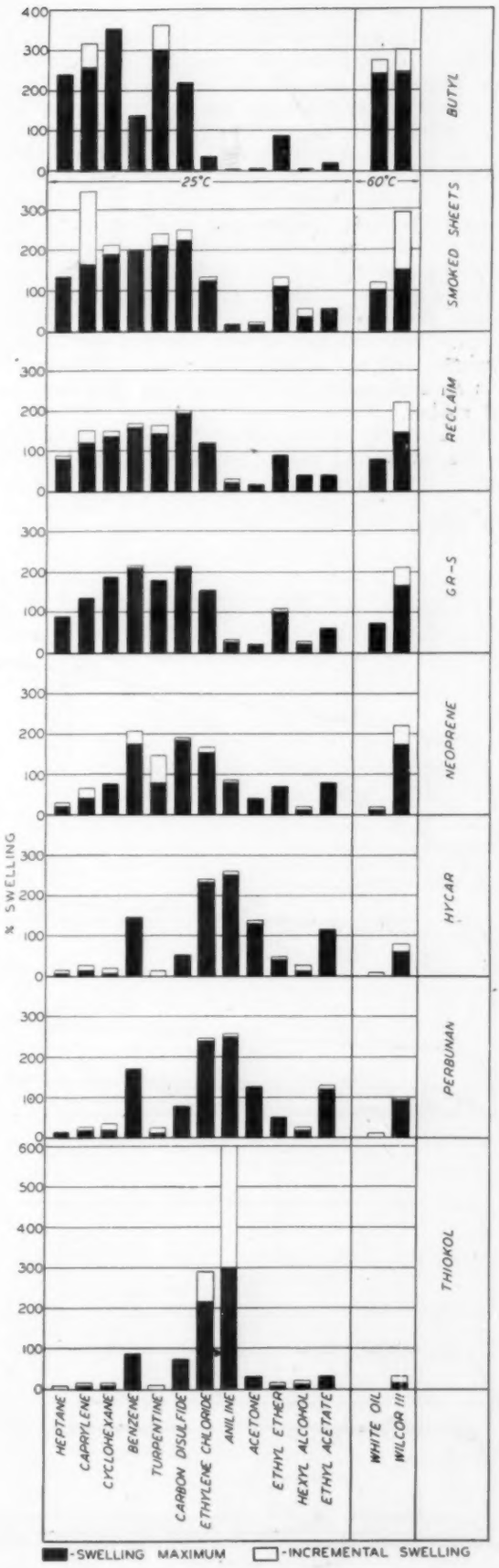

FIG. 1—Summary graph of swelling behaviour.

liquid during the initial rapid swelling period, and no further swelling occurred on prolonged immersion.

In Figures 2 to 5 are presented the characteristic time-swelling curves for all the rubbers in caprylene, heptane, benzene, cyclohexane, turpentine, carbon disulfide, ethylene chloride, aniline, acetone and ether.

The data presented in Figures 1 to 5 all point to the generalization that the swelling maxima of various rubbers in organic liquids is governed by similarity in structure between rubber and swelling liquid. In other words, the qualitative rules for predicting the swelling of rubbers in organic liquids appear to be the same as the general rules for predicting the solubility of organic compounds. This importance of similarity of structure between rubber and swelling media was first pointed out by Whitby, Evans and Pasternack *(18)* as an explanation for the swelling behaviour of natural rubber.

In an earlier paper from this laboratory *(2)* it was shown that structural similarity of rubber and liquid is also of importance in explaining the swelling of GR-S and the comparative swelling of GR-S and natural rubber, but that the swelling process is too complex to be reduced to a quantitative formula of general validity. The results of the present study, as presented in Figures 1 to 5, show that the principle of similarity of structure is generally applicable to the swelling of all rubbers.

Swelling of Hydrocarbon Rubbers in Hydrocarbon Liquids

The most striking evidence of the effect of similarity of structure is the comparative swelling of the hydrocarbon rubbers, Butyl, natural rubber and GR-S, in the hydrocarbon liquids.

In the saturated aliphatic hydrocarbon, heptane, Butyl, itself essentially a saturated aliphatic hydrocarbon, exhibits the highest swelling, followed by natural rubber, which is a straight chain hydrocarbon, although unsaturated. GR-S, which contains benzene rings in its rubber molecule, is least similar to the swelling liquid, and correspondingly shows the lowest swelling.

The effect of the presence of a double bond in the structure of the swelling liquid is to increase the

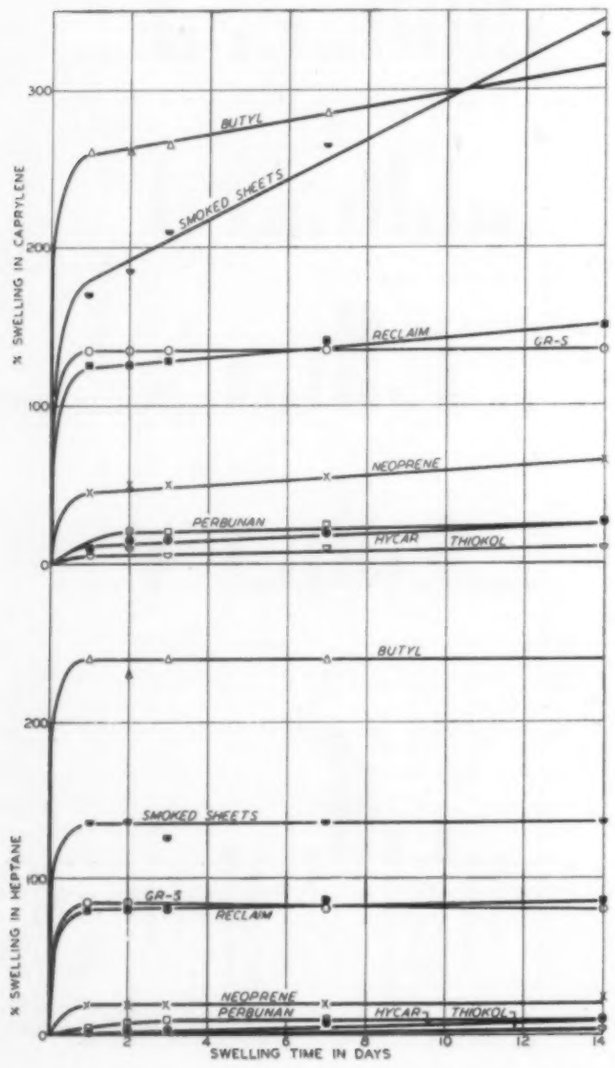

FIG. 2—Swelling in heptane and caprylene at 25°C.

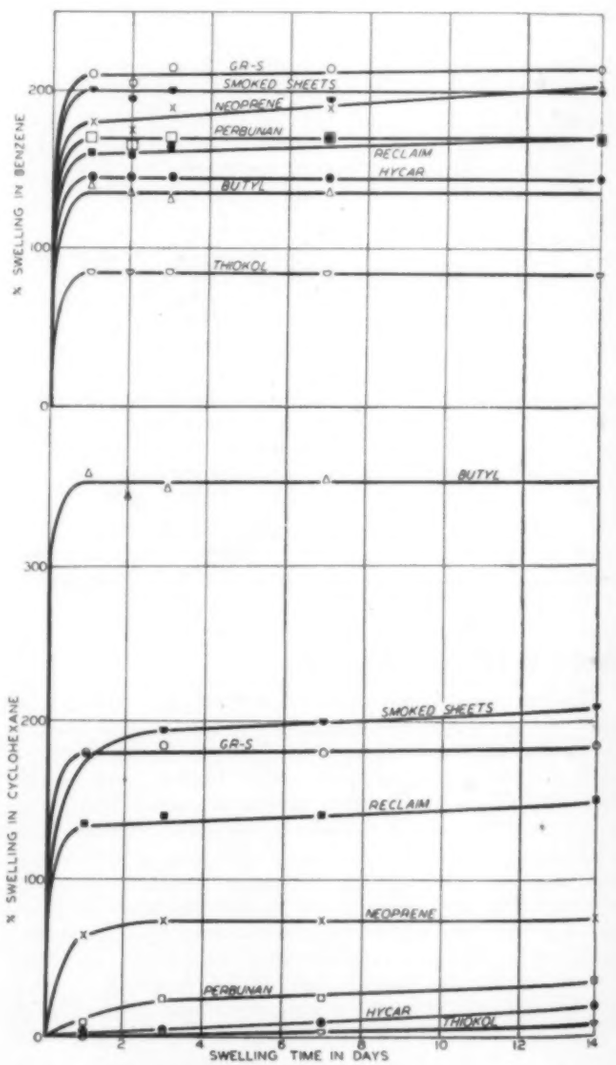

FIG. 3—Swelling in cyclohexane and benzene at 25°C.

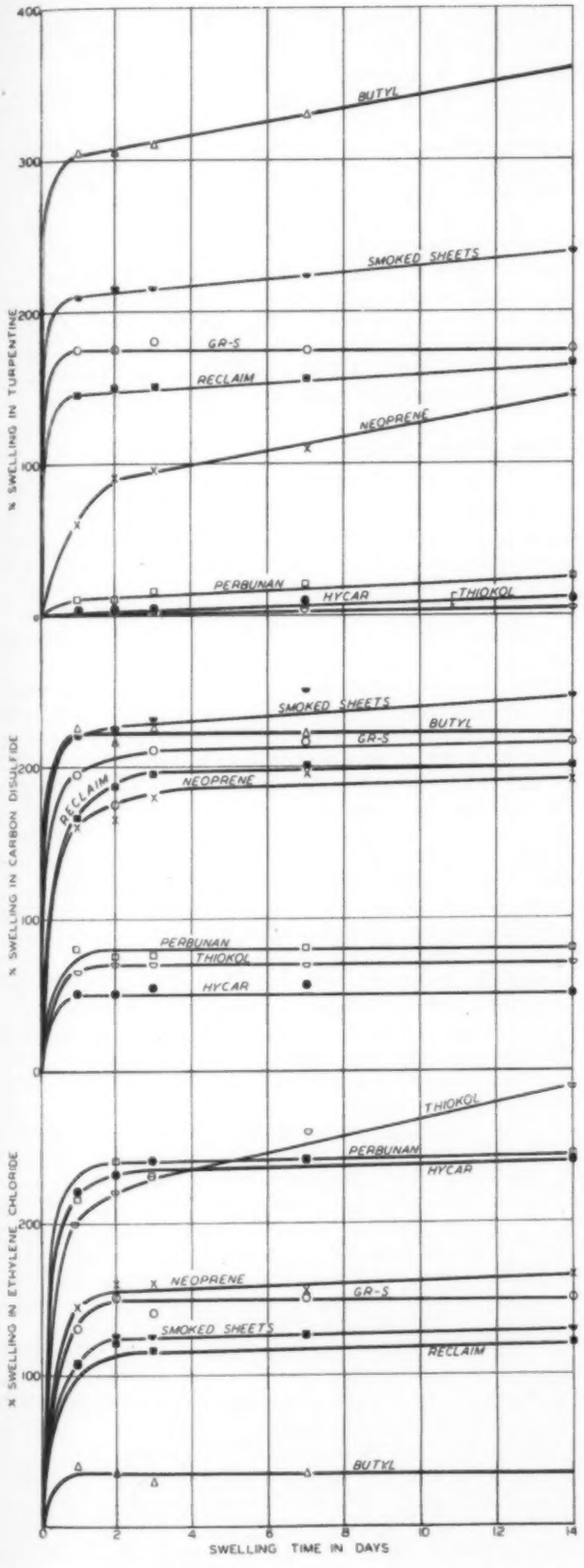

FIG. 4—Swelling in ethylene chloride, carbon disulfide and turpentine at 25°C.

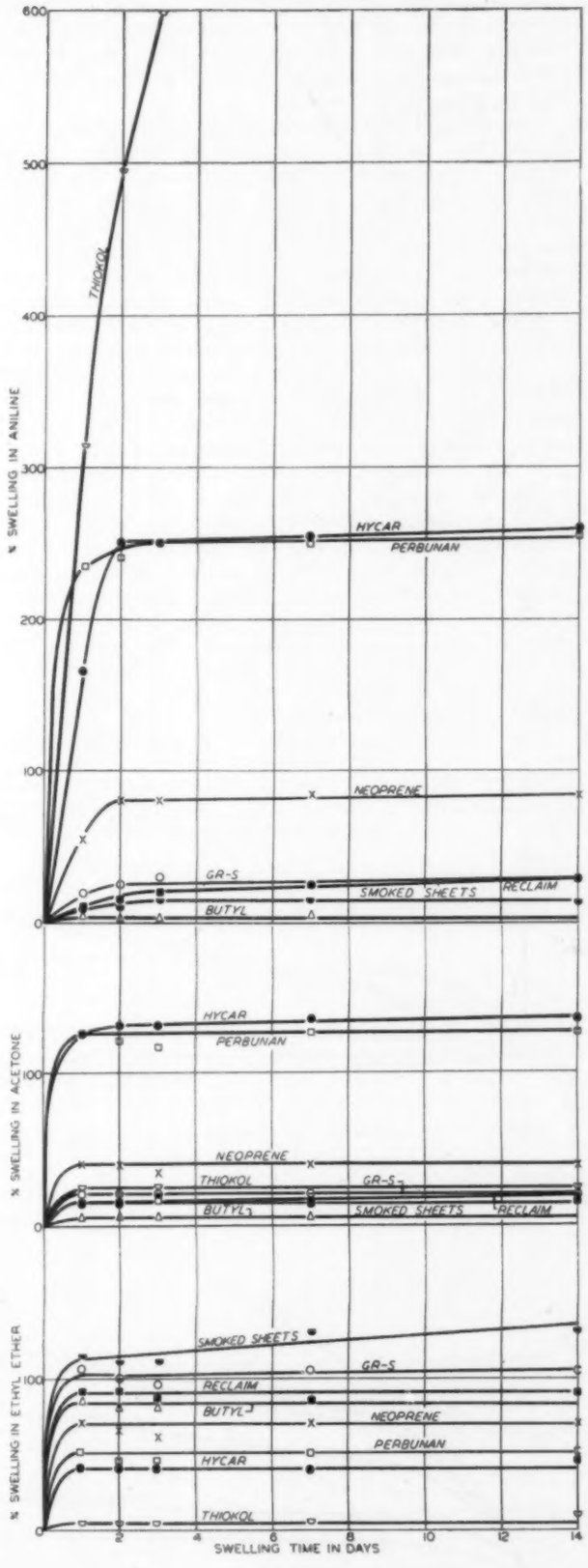

FIG. 5—Swelling in ethyl ether, acetone and aniline at 25°C.

swelling of both the unsaturated rubbers, GR-S and natural rubber, over their swelling in a saturated hydrocarbon, as can be seen from a comparison of their swelling in heptane and caprylene. Butyl, on the other hand, shows no increased swelling in caprylene over that in heptane.

The effect of an alicyclic ring in the structure of the swelling liquid is to increase the swelling maxima of all the rubbers over those in straight chain hydrocarbons. Thus, all the rubbers exhibit a higher swelling maximum in cyclohexane than in heptane. However, the predominant influence of structural similarity is in evidence in that GR-S, having ring structures in its molecule, exhibits a much greater difference between swelling in a straight chain and a cyclic hydrocarbon than do the other two hydrocarbon rubbers. The swelling maximum of GR-S in cyclohexane is almost two and one-half times that in heptane, while the swelling maxima of Butyl and smoked sheets in cyclohexane are less than one and one-half times those in heptane.

In the aromatic hydrocarbon, benzene, the effect of structural similarity on swelling is very pronounced. GR-S, containing benzene rings in the molecule, exhibits higher swelling than the other rubbers not containing aromatic rings.* Butyl, on the other hand, which swelled far more than the other rubbers in heptane, swells comparatively little in benzene, less in fact than some of the oil resistant rubbers. This swelling behaviour is in accord with the dissimilarity in structure between the essentially paraffinic Butyl and the aromatic swelling medium, benzene.

The effect of the heavier petroleum hydrocarbon oils under moderate swelling conditions (60°C.) is similar to that of the low molecular weight hydrocarbons. The swelling maxima of all the rubbers in the white oil are close to those in heptane. The swelling maxima in the unsaturated petroleum oil, Wilcox Reclaiming Oil 111, which is predominantly a mixture of unsaturated cyclic compounds, are higher than in the paraffin oil for all the rubbers except Butyl, corresponding to the effect of ring structure and unsaturation in the low molecular weight swelling liquids.

The swelling of the natural rubber reclaim compound parallels that of the smoked sheets compound in all the swelling liquids, but at a somewhat lower level, due to the extra filler present in the reclaim itself. Because of this extra filler content the swelling data on reclaim are actually for a lower rubber hydrocarbon content than with the other test compounds, and are thus not directly comparable with the other compounds.

* The particular lot of GR-S used in the experiments of the present investigation does not show the numerically great preferential swelling over natural rubber seen in the earlier experiments *(1,2,3)*, but the phenomenon is clearly in evidence in the measured data.

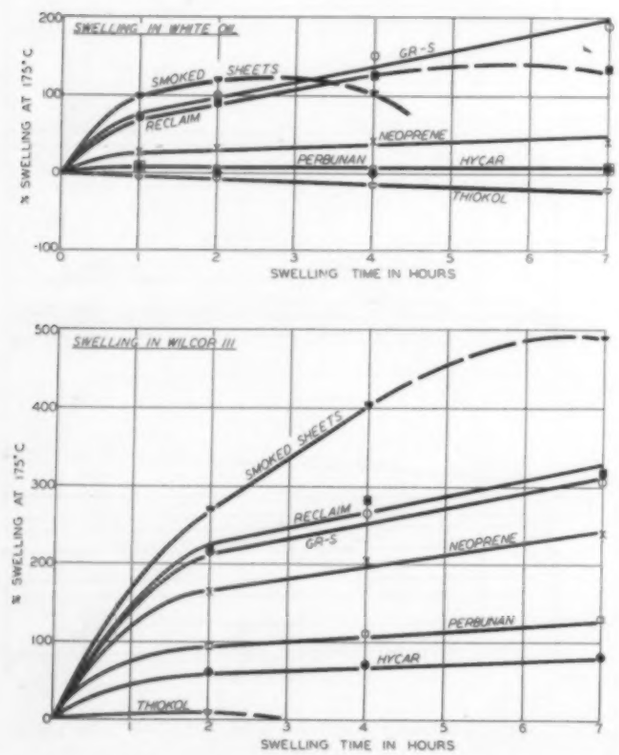

FIG. 6—High temperature swelling in petroleum oils.

Effect of Polar Groups

The effect of hydrocarbons on swelling as against the effect of polar liquids on the various rubbers also reflects the influence of similarity of structure. In the hydrocarbons and also in the nonpolar liquid, carbon disulfide, the hydrocarbon rubbers, natural rubber, natural rubber reclaim, GR-S and Butyl, exhibit comparatively high swelling, while the rubbers which contain polar groups exhibit low swelling. In highly polar liquids, on the other hand, this behaviour is reversed, in that the hydrocarbon rubbers swell very little, while the oil resistant rubbers swell to a greater extent and in inverse order to their swelling in hydrocarbons.

The effect of ether, which is not as highly polar as the ketone, the ester, the amine or the chloride, is in line with this phenomenon. The swelling effect is intermediate between that of the nonpolar hydrocarbons and the highly polar liquids. The swelling of the hydrocarbon rubbers in ether is lower than in hydrocarbons, and that of the oil resistant rubbers somewhat higher than in hydrocarbons. However, neither effect is very pronounced, so that the order in which the rubbers swell is essentially the same as in hydrocarbons.

The increase in swelling of the oil resistant rubbers in the unsaturated hydrocarbons in relation to the saturated could also be attributed to polarity of the double bond, induced by the protruding polar groups of the rubber molecule.

Among the oil resistant rubbers themselves, the comparative swelling appears to be influenced both by the polarity of the liquid and by the nature of the polar groups in the rubber molecule itself. Thus, it appears logical that neoprene, containing the chloride group, exhibits higher swelling in nonpolar liquids and lower swelling in polar liquids than the acrylonitrile polymers, containing the more highly polar nitrile group.

In hexyl alcohol the effect of the —OH group, unlike the other polar groups, is to depress the swelling of all the rubbers, but, except for the fact that Butyl swells hardly at all, the relative order of their swelling is the same as in the hydrocarbons. The presence of a polar group in a liquid is obviously not sufficient in itself to increase swelling of rubbers containing polar groups.

Only polar groups inducing an affinity of the liquid to the rubber sufficient to cause molecular association (solvation) appear to increase swelling. Swelling occurs, in general, if the affinity of liquid to rubber is large compared with the affinity of the molecules of the liquid among themselves.

Since the association between molecules containing —OH groups is extremely high, and rubber contains no —OH groups, the primary requirement for solvation, the adsorption of the liquid molecule by the rubber is hindered by the —OH group, which favors the liquid-to-liquid association. The ultimate swelling effect of an alcohol is consequently a balance between the influence of the —OH group and of the hydrocarbon radical, which favors the liquid-to-rubber association.

The abnormal behaviour of Thiokol, which is somewhat between a rubber and a thermoplastic resin, can also be depicted by applying the principle of "like dissolves like." Thiokol is quite different from the other rubbers in having sulfur in the main chain of the molecule, which obviously causes a loss of the typical hydrocarbon character, and the extraordinary resistance of Thiokol to hydrocarbons becomes understandable.

The visualization of the swelling behaviour of rubbers in liquids on the basis of such generalizations is helpful for gaining an over-all picture. It must be emphasized, however, that the above discussion is rather a description of the phenomena in general terms than an explanation of the process. The authors are of the opinion that any attempt to express the swelling process quantitatively by a simple mathematical expression is bound to fail. The exceptions to the rule in such attempts have always proven to be too numerous by necessity of the complexity of the phenomena to supply a practical and workable theory. Until better insight is gained into the nature of high polymers in general, the qualitative approach is the best guide for the rubber chemist faced with practical problems.

The characteristic swelling of various types of polymers in paraffinic and aromatic hydrocarbons and in a polar liquid has found an interesting application in a method of identifying natural and synthetic polymers *(19,20)*. According to this method of analysis, the polymer or polymer blend in an unknown sample may be identified from its swelling in petroleum ether, benzene and aniline under standard test conditions, according to its location on a logarithmic chart in which the ratios of swelling in benzene to that in petroleum ether are plotted against ratios of swelling in benzene to that in aniline for all polymers.

Swelling Increment and Disintegration of Rubber

The swelling maximum of the rubbers in the liquids, the figure characteristic for the initial rapid swelling, has been considered in the foregoing discussion. With a few liquid and rubber pairs the second factor in the swelling picture, the swelling increment, is of considerable importance for the swelling behaviour. The test conditions used in this study, two weeks' swelling at room temperature, were not sufficiently severe to allow any general conclusions to be drawn from the data on the slow, continuous swelling represented by the swelling increment. Either a longer test period or a higher test temperature would have to be used in order to obtain significant data. However, with most of the liquids and rubbers tested in this study it can be stated that the swelling increment is so small as to be of secondary practical importance to the swelling maximum at low temperatures.

In only a few instances is the swelling increment high enough that this secondary swelling effect warrants mention. The behaviour of Thiokol in aniline is outstanding in that instead of swelling rapidly to a

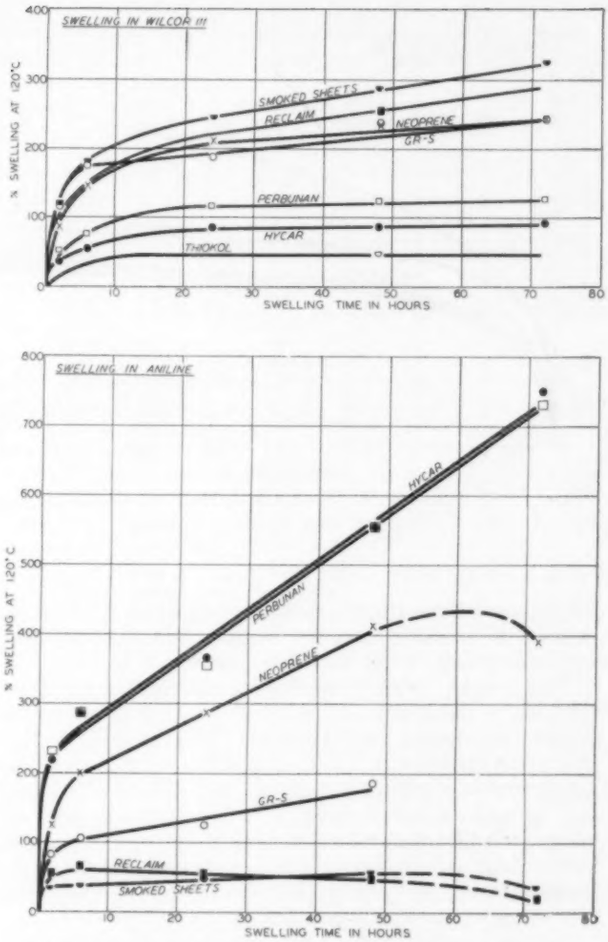

FIG. 7—Swelling in unsaturated oil and aniline.

maximum and then more slowly, it swells rapidly even at room temperature with little decrease in rate of swelling after the initial volume increase, so that by seven days at room temperature the test specimen had disintegrated completely. This deleterious effect of aromatic amines on polysulfide rubbers like Thiokol FA has been pointed out in detail in a report of a study made under the sponsorship of the British Ministry of Supply on the effect of aviation gasolines containing amines on synthetic rubbers *(21)*.

Other instances in which the swelling increment is of great enough magnitude to be of considerable practical importance at room temperature are with natural rubber and Butyl in the unsaturated hydrocarbon, caprylene; with Butyl and neoprene in the terpene hydrocarbon, turpentine; and, with Thiokol in the chlorine compound, ethylene chloride. In any practical consideration of the effect of these liquids on these rubbers, the swelling maximum would be of subordinate importance in comparison with the swelling increment.

A few tests were made in order to have an indication of the effect of petroleum oils on the rubbers under severe test conditions, which effect had been studied in detail with natural rubber and GR-S in a previous investigation *(3)*. For this purpose swelling tests were carried out in the two petroleum oils, the white oil and the unsaturated oil, at 175°C. The results of these tests

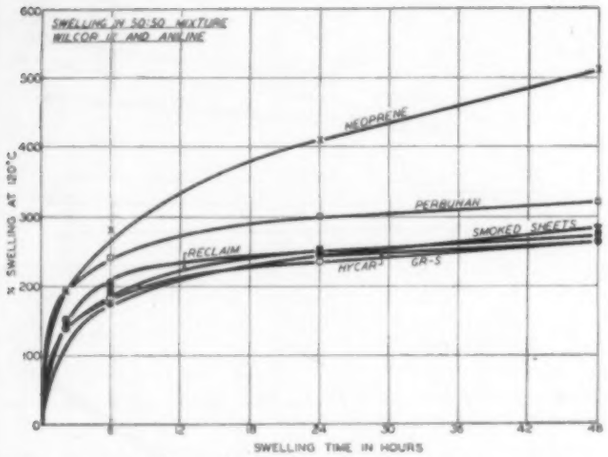

FIG. 8—Swelling in 50:50 mixture of unsaturated oil and aniline.

are presented in Figure 6. In this figure a broken line is used to indicate that the sample was disintegrating and dispersing in the swelling liquid.

The results confirm the findings of the earlier study that in a paraffinic oil natural rubber disintegrated completely during the seven-hour test period, without any great increase in volume, and that GR-S exhibited considerable swelling increment. Of the other rubbers, the natural rubber reclaim, as might be expected, disintegrated like natural rubber, although not so rapidly, while none of the oil resistant rubbers showed either disintegration or any greatly increased swelling over that under less severe conditions.

In the unsaturated oil the natural rubber showed a rapid swelling and finally also disintegrated, although the process did not progress so rapidly as in the paraffinic oil. Thiokol, on the other hand, on which the paraffinic oil at this temperature had little effect, disintegrated rapidly. The other rubbers consistently showed a much higher swelling increment, as well as higher initial swelling, in the unsaturated oil compared with the paraffinic oil. Since unsaturated oils of this type, in distinction to paraffinic oils, react with sulfur at elevated temperatures, this increased swelling increment might be due to a loss of sulfur from the vulcanizate to the unsaturated oil, or, with Thiokol, to a removal of sulfur from the polymer chain.

Combination of a Hydrocarbon with a Polar Liquid

In a previous publication in this series *(1)* it was shown that by proper choice of a hydrocarbon oil it was possible to swell vulcanized GR-S and natural rubber to the same extent. The value was pointed out of this possibility for choosing a reclaiming oil to use in reclaiming mixed scrap containing these two rubbers. The results of the present study have shown that when considering the whole range of both general purpose and oil resistant rubbers, the order of swelling in polar liquids is the reverse of that in hydrocarbons. This fact promises that by using a combination of a polar liquid with a hydrocarbon, equal swelling can be achieved with combinations of rubbers where one ingredient is or may be an oil resistant rubber.

To test the feasibility of such a combination, the swelling of GR-S, smoked sheets, reclaim and the oil resistant rubbers was measured in various combinations of aniline and the unsaturated hydrocarbon oil, Wilcor Reclaiming Oil 111, which was shown to be an example of an oil which gives equal swelling of GR-S and natural rubber. A swelling temperature of 120°C. was used in these tests in order to obtain rapid swelling without disintegration during the test period.

In Figures 7 and 8 are presented the time-swelling curves for the rubbers in the unsaturated oil, in aniline, and in a 50:50 mixture of the two. In Figure 9 are plotted the results of swelling for 48 hours in mixtures of the unsaturated oil and aniline of various proportions. The graphs show that mixtures of this

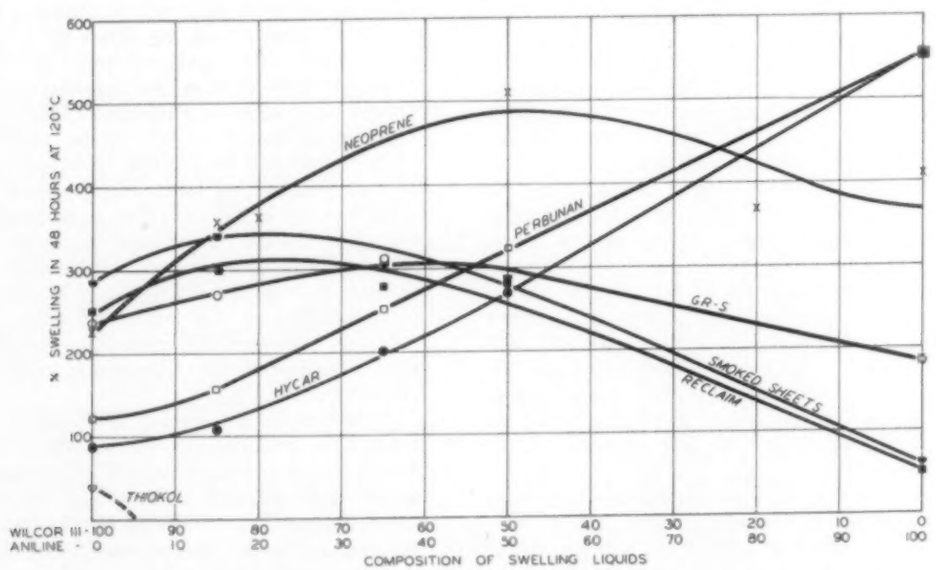

FIG. 9—Swelling in mixtures of unsaturated oil and aniline of various proportions.

pair of liquids can be made which give equal swelling of any pair of rubbers with the exception of Thiokol which disintegrates. Thiokol obviously reacts chemically with aniline, and disintegrates completely in a relatively short time in a mixture containing even small amounts of aniline. This complete disintegration of Thiokol, and its consequent removal from a mixture of rubbers, could be a definite advantage in reclaiming a mixed scrap in which Thiokol might be present but undesirable for later compounding.

An interesting combination of the two swelling liquids, aniline and Wilcor Reclaiming Oil 111, is the 50:50 mixture, in that it gives equal swelling of all compounds tested with the exception of Thiokol, which disintegrates, and neoprene, which swells most in this mixture. The curve for neoprene shows a maximum at the 50:50 mixture, and suggests an effect similar to the increased solubility of low molecular weight products in mixed solvents, probably caused by the combined effect of association of one of the solvents and increased solubility of the resulting solvate. It can be visualized that the attraction between the amino groups and the chlorine atoms results in an orientation of aniline molecules along the rubber chain with benzene rings protruding, which increases the hydrocarbon character of the neoprene, making it swell more in the hydrocarbon oil.

The natural rubber compounds exhibit maxima at the 80:20 mixture, and GR-S near the 50:50 mixture; the nitrile rubbers, Perbunan and Hycar, show approximately linear increase in swelling with increase of aniline concentration.

The possibility of using a blend of a polar and a nonpolar liquid as a reclaiming oil suggests a variety of practical applications. Although aniline was used in these tests, the same type of results could certainly be obtained by using combinations of the hydrocarbon oil with another polar liquid having similar swelling effect on the rubbers, such as another amine or a chlorine compound. Ethylene chloride, the chlorine compound tested in the present study, had a swelling effect on the rubbers similar to aniline, and, since the same should be true of other chlorine compounds, a great number of practical mixtures of liquids appear promising.

Summary

Earlier studies on the swelling of GR-S and smoked sheets have been extended to a comparison of the swelling of these rubbers with that of Butyl, natural rubber whole tire reclaim, Neoprene GN, Hycar OR-25, Perbunan and Thiokol FA in representative organic liquids of a number of chemical types. Relationship between swelling and similarity of structure of the rubber and the swelling liquid has been shown to describe the swelling behaviour of other types of rubber as well as that of GR-S and natural rubber.

With the oil resistant rubbers, containing polar groups in the rubber molecule, polarity of the swelling liquid was shown to increase swelling. That the behaviour of Thiokol fails to conform to the general pattern of the swelling of other rubbers is in accordance with the completely different character of the molecule of this polymer, which, unlike other rubbers, contains sulfur as part of the principal chain of the molecule.

The possibility of choosing a reclaiming oil to give equal swelling of the components of mixed scrap exists also for scrap containing an oil resistant rubber, if a liquid is used consisting of a combination of a polar with a nonpolar liquid.

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A new instrument for determining the **heat distortion of plastics** according to A.S.T.M. D-648 has been announced by the American Instrument Co., Silver Spring, Maryland. It consists essentially of an oil bath heated by a 2000-watt immersion heater, a centrifugal pump for circulating the bath liquid, a coil for cooling the bath liquid to room temperature after each test, a synchronous motor-driven bimetallic thermoregulator, a control box, four specimen holders, and a loading stand for the specimen holders.

Metron Instrument Co., Denver 9, Colorado, has introduced a line of hand type **25D linear speed meters** for measuring speed of travel. Usually supplied as single range instruments, they provide an accuracy of 1% and are available in a wide selection of ranges from 3 to 3,000 yards per minute or 10 to 10,000 feet per minute.

Why Industrial Hygiene in a Rubber Company?

By WILLIAM E. McCORMICK

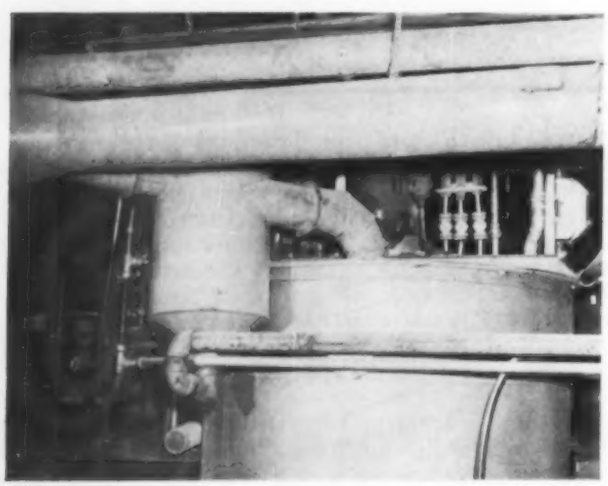
Director of Industrial Hygiene, B. F. Goodrich Co., Akron, Ohio

THE science of industrial hygiene has come of age. Its growth, although slow, has been continuous since its American inception just prior to the first World War. It remained, however, for the events of the last decade—notably the passage of the Social Security Act in 1936, and World War II—to provide it with its needed stature. In assessing the value to be derived from a well organized industrial hygiene program in a large industrial company, certain tangible benefits can be expected. These benefits are not applicable to any one industry, but are common to all.

Value of Industrial Hygiene

First, there should be tangible benefits resulting in the form of *lower compensation costs.* While it is true that the number of occupational disease claims is small as compared to those due to industrial accidents, the severity of the former is usually much greater than the latter. Any reduction in claims, either in frequency or severity, will be directly reflected in lower compensation costs. Furthermore, certain factors such as poor ventilation, poor illumination, obnoxious dusts and odors, and excessive noise, although not necessarily directly causing occupational disease, may contribute to the production of industrial accidents.

A second benefit might be termed *more efficient production.* The improvement of environmental working conditions generally has been found to increase workers' efficiency and morale. Numerous instances can be cited where, during the past few years, strikes and work stoppages have been prevented by the timely correction of unhealthful conditions, or by satisfactorily acquainting employees with factual evidence of the non-existence of alleged health hazards.



Controlling acrylonitrile vapors in the manufacture of Hycar rubber. Note the exhaust ventilation at the large extractor.

Control of solvent vapors by local exhaust ventilation (slot at edge of table top) at a fabric cementing operation.

Lower *absenteeism* should also result. This is somewhat a corollary of the preceeding paragraph. It is a known fact that absenteeism, from whatever cause, results in tremendous costs to both employer and employee. The vice-president of one of the country's large companies has estimated the employer cost as approximating $70 per year for each employee carried on the payroll of the company. There, of course, is an irreducible minimum for absenteeism, but it is not difficult to see that any substantial reduction caused by improved employee health, better plant working conditions, or better employee morale, will pay dividends.

Finally, an *improvement in the quality of marketable* product should result. An improved worker efficiency may, of course, be reflected in this, but frequently the proper control of contaminants resulting from the manufacturing operation may result in improved marketable qualities. This is particularly true of those operations wherein very small quantities of impurities derivable from atmospheric contamination may adversely affect the consumer product.

Program at Goodrich

Since 1942 the B. F. Goodrich Company has been actively interested in industrial hygiene. A laboratory was maintained for this purpose, functioning as a part of the Works Laboratory. Recently the need for further expanding these activities, and more closely coordinating them with the medical activities of the company, was realized. This has resulted in the very

(Continued on Page 328)

Variations of Physical Tests of Elastomers Between Different Laboratories

By CAPT. HAROLD B. MORRIS[1] and CAPT. CHARLES H. GERWELS[2]

Chemical Warfare Service, Edgewood Arsenal, Maryland

SPECIFICATIONS have been aptly described as the Purchasing Agent's Dream and the Technical Director's Headache. Whether writing one or conforming to one there are two basic problems involved: (1) Does the material do the job?, and (2) Will the specification requirements define a product as adequate from the standpoint of service and price?

In this paper it is assumed that both problems have been considered, a material selected and the specification with adequate tolerances is available to control it. It is also postulated that a consumer has placed an order with a supplier for this material.

A successful transaction now depends upon the agreement of the laboratories of the supplier and purchaser on results of validating tests made to assure uniform quality of the product. A third disinterested laboratory may be involved as a neutral, to be a judge or referee. Complete accord of test results assures a steady flow of material and compensation. It is very simple as described, but it seldom works that way. It seldom works that way because two or more laboratories frequently do not agree on test values of identical materials.

The Inspection Division of the Chemical Warfare Service made an investigation in an effort to determine the latitude of variation of specification test results between different Laboratories. Access to many suppliers has made it possible to obtain a reasonably complete picture. It is hoped that the data presented in

Note: This article is based on a paper delivered by Capt. Morris before the New York Rubber Group at New York, N. Y., on October 6, 1944.

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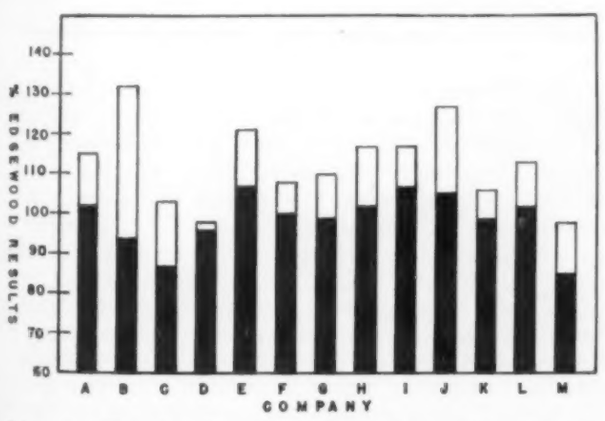

FIG. 1—Tensile Strength Comparison. (Note: Figures 1, 2, 3 and 4 indicate results achieved by Method A. The tops of the shaded areas give minimum values while the tops of the clear areas give maximum values; the difference is the range.)

TABLE I—TENSILE STRENGTH COMPARISONS

Code Letter	*Date*	*Supplier Tensile*	*Edgewood Tensile*	*Percent Values*
A	December	3496	3060	114%
	February	3099	2680	115%
	March	2590	2530	102%
	March	2000	1760	115%
B	December	3290	3215	102%
	December	2150	2085	103%
	January	2450	1860	132%
	January	3650	3000	122%
	February	2050	1960	105%
	February	3360	3390	99%
	March	2000	2130	94%
	March	3360	3320	101%
	April	1920	1800	107%
C	December	1740	1780	98%
	January	1690	1765	96%
	February	2352	2285	103%
	March	2200	2530	87%
D	November	1973	2010	98%
	December	2000	2035	98%
	March	1659	1720	96%
E	December	2000	1875	107%
	January	2450	2030	121%
	February	2458	2130	115%
	March	2034	1810	112%
F	December	1790	1795	99.7%
	January	1870	1735	108%
	February	1850	1810	102%
	March	1775	1725	103%
G	December	2388	2260	106%
	January	2263	2060	110%
	February	2218	2220	99.9%
	March	2278	2310	99%
H	December	2732	2330	117%
	January	2085	1850	113%
	February	2104	2045	103%
	March	2135	2085	102%
I	December	3200	2735	117%
	January	3200	3050	107%
K	January	1900	1910	99%
	February	2010	1890	106%
L	December	3443	3390	102%
	January	3473	3060	113%
	February	3293	3060	108%
	March	3433	3370	102%
M	February	2885	2950	98%
	February	1600	1880	85%
	March	3375	3690	91%
	March	1740	1775	98%
J	December	3470	3290	105%
	January	3700	3090	120%
	February	4506	3575	126%
	March	4310	3395	127%

TABLE II—ULTIMATE ELONGATION COMPARISONS

Code Letter	Date	C Elong.	E Elong.	Percent Values
A	December	755	750	100.6%
	February	790	758	104%
	March	875	775	113%
	March	712	725	98%
B	December	880	745	118%
	December	1030	945	109%
	January	980	920	107%
	January	800	740	108%
	February	980	960	102%
	February	755	782	97%
	March	1070	1038	103%
	March	790	765	103%
	April	1000	917	109%
C	December	765	765	92%
	January	810	825	98%
	February	900	930	97%
	March	820	880	93%
D	November	660	666	99%
	December	655	655	100%
	March	712	735	97%
E	December	830	835	99%
	January	810	815	99%
	February	850	930	91%
	March	713	730	98%
F	December	775	765	101%
	January	660	693	95%
	February	720	795	91%
	March	765	765	100%
G	December	875	885	99%
	January	875	890	98%
	February	908	923	98%
	March	900	918	98%
H	December	783	775	101%
	January	918	890	103%
	February	814	790	103%
	March	705	755	93%
I	December	670	735	91%
	January	760	770	99%
K	January	625	695	90%
	February	715	723	99%
L	December	753	747	101%
	January	783	750	104%
	February	737	723	102%
	March	707	703	101%
M	February	770	740	104%
	February	720	705	102%
	March	740	745	99%
	March	780	765	102%
J	December	875	735	119%
	January	875	743	118%
	February	800	735	109%
	March	785	705	111%

TABLE III—MODULUS COMPARISONS

Code Letter	Date	C Modulus	E Modulus	Percent Value
A	December	180	...	.....
	February	150	163	110%
	March	150	147	102%
	March	421	381	110%
B	December	135	170	79%
	December	200	261	76%
	January	235	261	90%
	January	160	171	93%
	February	189	254	74%
	February	141	179	78%
	March	160	226	70%
	March	163	176	92%
	April	165	215	76%
C	December	218	232	93%
	January	170	219	77%
	February	150	238	63%
	March	200	286	69%
D	November	170	244	69%
	December	190	275	69%
	March	187	225	83%
E	December	237	271	87%
	January	264	344	76%
	February	237	255	93%
	March	265	293	90%
F	December	284	342	82%
	January	225	326	69%
	February	240	309	77%
	March	222	305	72%
G	December	217	262	82%
	January	221	226	97%
	February	177	247	71%
	March	200	259	77%
H	December	168	175	96%
	January	218	238	91%
	February	199	288	69%
	March	230	303	75%
I	December	116	174	78%
	January	100	190	52%
K	January	250	336	74%
	February	245	321	76%
L	December	146	182	80%
	January	142	217	65%
	February	170	204	84%
	March	196	248	79%
M	February	250	362	69%
	March	250	323	77%
J	December	...	...	.....
	January	208	218	95%
	February	353	220	160%
	March	330	246	134%

this paper showing how widely test results do vary will be helpful to all suppliers and consumers.

No attempt is made to explain why these results vary—the probable causes have been the subject of much investigation. It has been reported that factors such as temperature, testing machines, test methods, sample preparation, age of samples and many others contribute to more or less general disagreement. The data obtained is presented here as a practical result indicative only of how wide the variation can be.

All results from the participating laboratories are coded in the tables and graphs.

Investigation

In order to investigate this problem, two methods were adopted:

1. **Method A**—Each supplier prepared duplicate sets of slabs of elastomer material used in Chemical Warfare Service parts; sent one set to Inspection Division, Edgewood Arsenal, retained the other set; both laboratories tested these sets on the same day to eliminate as much as possible the conditioning effect of aging. This method had the advantage that a great variety of compounds could be tested in this manner. It, however, had the disadvantage that the only comparisons made would be with the laboratory at Edgewood and no comparisons could be made between the other laboratories themselves.

2. **Method B**—Sample slabs from as nearly identical material as possible were compounded and cured at Edgewood Arsenal, and sent to various testing facilities to be tested there on a specified date. The results of these tests were reviewed and compared with results obtained at Edgewood Arsenal. The advantage of this method is that a distinct comparison could be given between all the testing facilities; the disadvantage is that

TABLE IV—TEAR RESISTANCE COMPARISONS

Code Letter	*Date*	*C Tear*	*E Tear*	*Percent Value*
A	December	...	...	.....
	February	296	214	138%
	March	247	188	131%
	March	283	199	142%
B	December	273	242	112%
	December	270	286	93%
	January	296	299	98%
	January	299	254	117%
	February	276	259	106%
	February	250	232	107%
	March	242	270	90%
	March	216	249	87%
	April	281	311	90%
C	December	165	187	88%
	January	127	169	75%
	February	248	270	91%
	March	310	248	125%
D	December	249	286	87%
E	December	200	192	104%
	February	251	265	94%
	March	226	235	96%
F	December	220	239	92%
	January	202	202	100%
	February	210	230	91%
	March	190	206	92%
G	December	231	218	105%
	January	263	213	123%
	February	245	223	109%
	March	256	236	108%
H	December	384	334	114%
	January	286	252	113%
	February	261	225	116%
	March	281	259	108%
K	January	230	191	120%
	February	180	204	88%
L	December	322	195	165%
	January	281	211	133%
	February	284	188	148%
	March	289	145	199%
M	February	210	172	122%
	March	170	107	158%
	February	195	205	95%
	March	170	220	77%

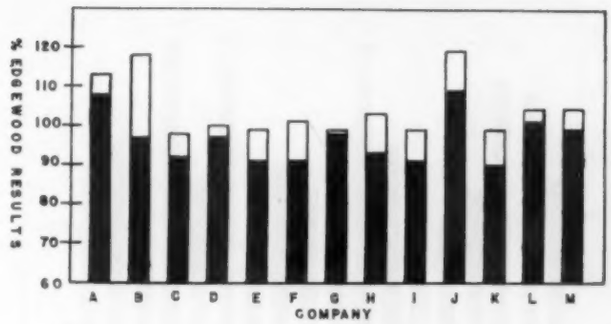

FIG. 2—Ultimate Elongation Comparisons.

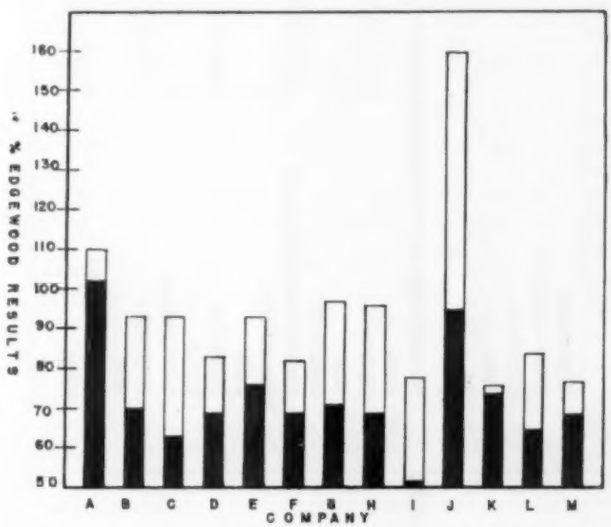

FIG. 3—Modulus at 200% Elongation Comparisons.

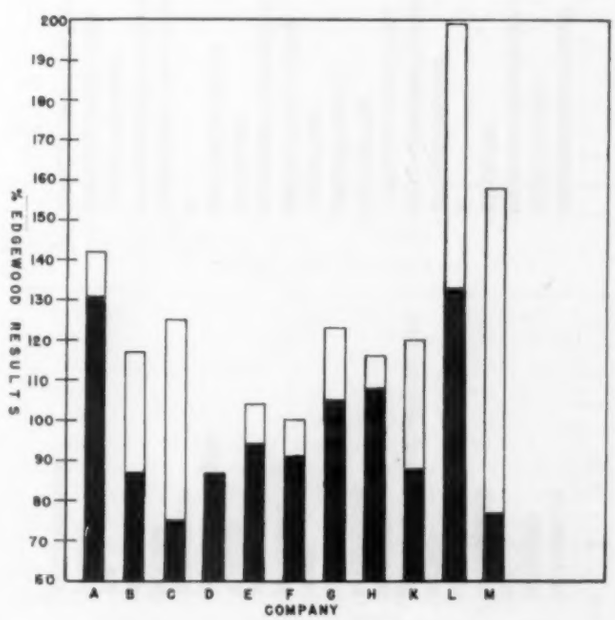

FIG. 4—Tear Resistance Comparisons.

only one type of material was used in these tests. However, a combination of the two methods presents a valuable picture of the comparison of the various testing laboratories' results.

In both methods of investigation, the testing laboratories were advised that tests required were: tensile at break, tensile stress (modulus) at 200%, ultimate elongation and tear resistance. Durometer hardness was included in Method B. Tests were to be used for correlation purposes and were to be conducted in accordance with Federal Specification ZZ-R-601, tear resistance as in ASTM designation D624-41T, Method B, and Shore "A" durometer hardness.

METHOD A

In Method A, the various companies cured duplicate sets of slabs, sending one set to Edgewood Arsenal, both facilities testing these slabs on about the tenth of the current month. These tests extended over a period of four months. The slabs were tested for tensile strength, elongation, tensile stress at 200% elongation, and tear resistance. The results of these tests are given in Tables I, II, III and IV, each company being represented by a code letter. The percentage values were determined as follows:

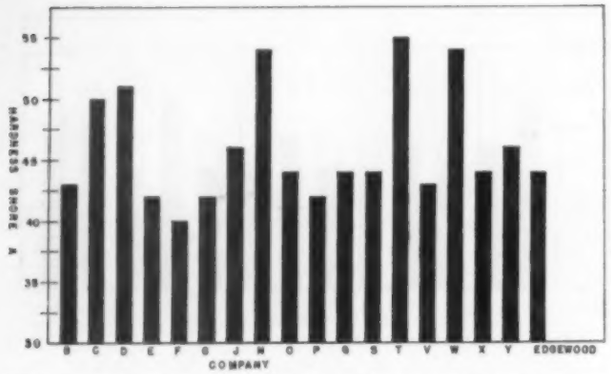

FIG. 5—Hardness Values Reported by Various Companies. (Note: Figures 5, 6, 7, 8 and 9 indicate results achieved by Method B.)

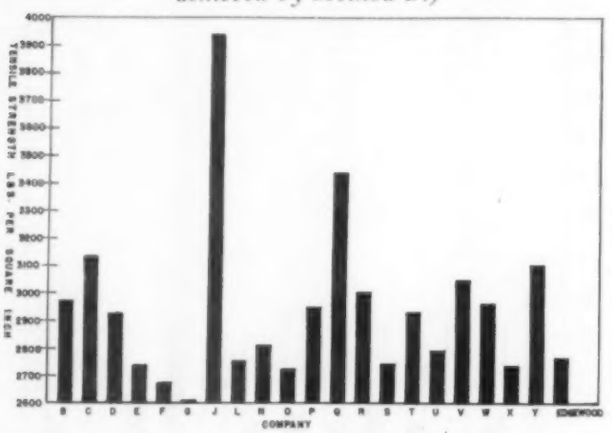

FIG. 6—Tensile Strength Values.

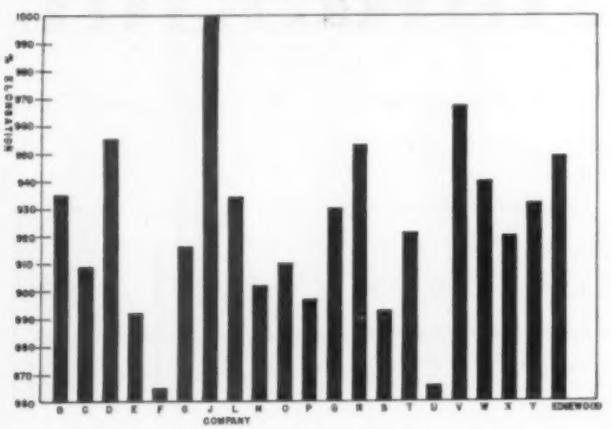

FIG. 7—Ultimate Elongation Values.

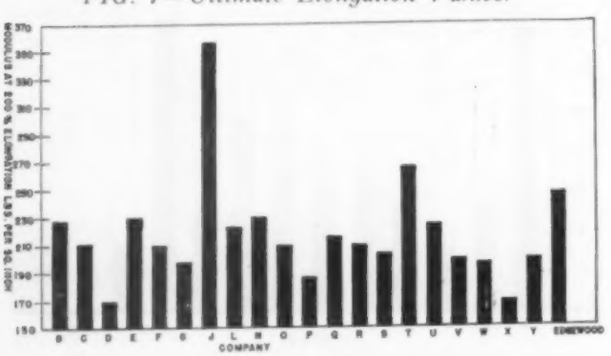

FIG. 8—Modulus at 200% Elongation.

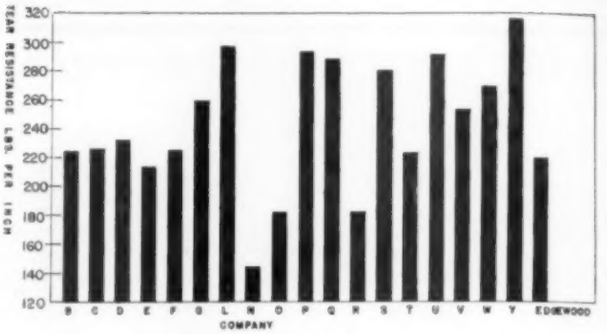

FIG. 9—Tear Resistance.

$$\frac{\text{Supplier Values} \times 100}{\text{Edgewood Arsenal Values}}$$

The results given on Tables I, II, III, and IV are shown graphically on Figures 1, 2, 3, and 4. On these graphs is plotted the percentage of Edgewood's results obtained by the various participating companies. The top of the shaded area gives the minimum value, and the maximum value is shown on the top of the clear area for each company; the difference in the area is the range.

METHOD B

Forty-eight slabs were made out of a type GR-M compound, cured and sent to various testing facilities, where they were tested and results sent to Edgewood Arsenal. The formulation of this test compound is as follows:

TEST COMPOUND FORMULA

GR-M	100.00
Magnesium Oxide	5.00
Zinc Oxide	10.00
Semi-Reinforcing Black	20.00
Processing Oil	15.00
Neozone A	4.00
Di-Benzylamine	.50

TABLE V—REPORT OF RESULTS FROM DIFFERENT LABORATORIES

Code	*Hard.*	*Tens.*	*Elong.*	*Mod.*	*Tear*
C	50	3134	909	211	226
J	46	3938	1000	356	...
Y	46	3102	932	200	316
N	54	2810	902	230	144
O	44	2725	910	210	182
P	42	2950	897	187	293
Q	44	3435	930	216	288
R	..	3005	953	210	182
S	44	2745	893	204	280
T	55	2936	921	266	223
B	43	2875	935	228	224
G	42	2599	916	198	259
U	..	2793	866	225	291
L	..	2757	934	223	297
V	43	3050	967	200	253
D	51	2927	955	170	232
F	40	2675	865	210	225
W	54	2965	940	197	269
E	42	2740	892	230	213
Edgewood	44	2770	949	247	220
X	44	2740	920	170	...

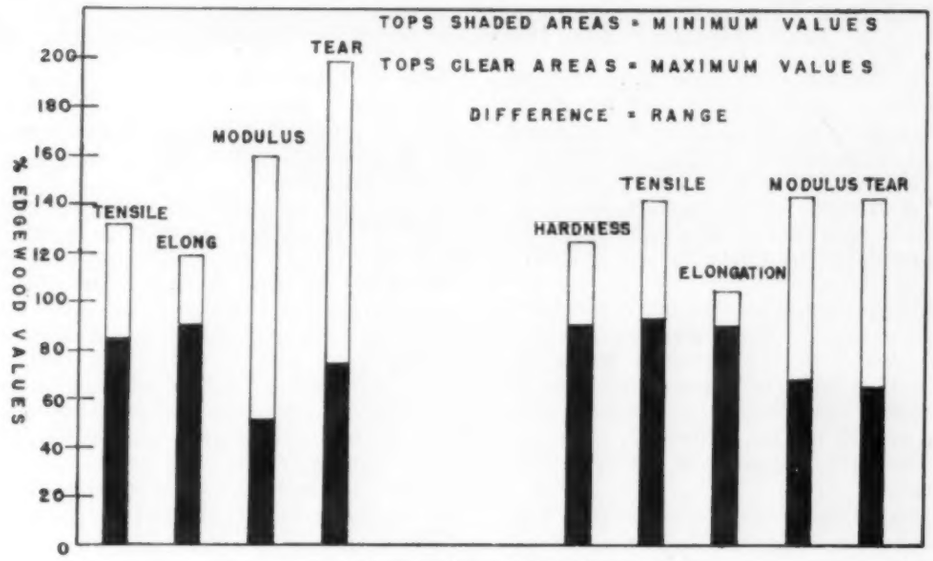

FIG. 10—Comparison of Various Tests.

These tests slabs were all cured at 320° for 20 minutes.

Before sending these slabs out, one test coupon was taken out of each slab and tested at Edgewood Arsenal for modulus at 200% elongation, tensile strength and ultimate elongation, and no slabs were sent out which did not meet the following requirements:

1.—Tensile strength not to vary over ± 5% from the average.

2.—Modulus not to vary over 5% from the average.

3.—Ultimate elongation not to vary over 3% from the average.

The following physical tests were investigated: Tensile Strength, Ultimate Elongation, Modulus at 200% Elongation, Tear Resistance, Hardness.

Results from seven commercial laboratories are included in this part of the investigation. The results of these tests are given in Table V and shown graphically in Figures 5, 6, 7, 8, and 9.

In these graphs actual values instead of percentage values obtained from the tests are shown due to the fact that all laboratories were testing the same material. Figure 10 is a comparison of the various tests as to their standardization values obtained from the results given in both Methods A and B. This graph was made by plotting the extreme differences, and for this reason must be interpreted with some caution. All the numerical values are given so that the reader can exclude any results that he feels are so out of line as to be unreasonable.

Conclusion

Results reported indicate that correlation of testing is a very major problem to be solved by industry. The magnitude of the task is enhanced by the plan to catalogue synthetics according to property requirements. Until this problem is solved, the foregoing data points to a definite need for close and reasonable collaboration of supplier and consumer. Each must recognize the others' problems and their mutual effect.

ACKNOWLEDGMENT

The authors appreciate the permission of the Chemical Warfare Service to publish this paper. The Chemical Warfare Service and the authors wish to acknowledge the excellent cooperation of its suppliers and the commercial laboratories which made this investigation possible.

Apply "Retread" Idea to Industrial Apron Business

MANUFACTURERS whose industrial apron bill runs them a few hundred to several thousand dollars a year should welcome the ingenuity of the Columbus Glove Manufacturing Co., of Columbus Ohio, which has applied the "retread" idea to the industrial apron business.

According to A. T. Francis, owner of the Columbus concern, most aprons wear or break through in just one or two places. Therefore, he reasoned, to make the apron as good as new it should only be necessary to patch the badly worn spot and then retreat the entire fabric with a neoprene solution, such as the company uses in making its new aprons.

The result of repairing or "retreading" industrial aprons is said to be an apron that looks new and which in many cases will serve as well as a completely new garment of equal weight and size. In fact, the company states, a "retreaded" apron may last longer than the original garments because the used apron is patched and doubly reinforced at the worn or damaged spot, so that it is strengthened at the very point where it receives greatest wear.

The "retread" process is being applied to white and colored aprons as well as to the standard black types. Other advantages claimed for the "retreading" are that aprons are oil-proof, washable, pliable, and weigh less than a pound. The country's industrial apron bill is estimated at approximately $25,000,000, and the "retreading" method is expected to reduce this amount considerably.

Solution to the Problem of Uniform Abrasion

RESISTANCE to abrasion is an important factor in the serviceability of many organic and inorganic products, such as textiles, rubber, plastics, leather, linoleum, ceramics, mastic tiles, concrete, stone, wood, and metal. The National Bureau of Standards is at present engaged in research on the measurement of resistance to abrasion as a part of the broad program on abrasion conducted by the Office of the Quartermaster General.

One of the major problems in this work has been the design and development of an abrasion machine that will abrade a plane area of a specimen uniformly over the entire surface and from every direction in its plane. A complete mathematical solution to this problem has been worked out by Herbert F. Schiefer, and a machine based upon the solution has been constructed at the Bureau.

In an attempt to approximate the conditions that produce uniform abrasion, numerous abrasion machines have been developed, several with highly complicated mechanisms. However, in most cases the relative motion between the specimen and abradant is not the same for the whole area of the specimen to be abraded, and in no case is it the same from every direction in the plane of the abraded surface.

In the mathematical solution that was obtained, the abrasion at any instant is constant in magnitude and direction over the whole abraded area. From instant to instant the amount of abrasion remains constant, but the direction changes continuously through 360° in each cycle. This general solution requires the plane areas of the abradant and of the specimen, which are in contact under pressure, rotate in the same direction and with the same angular velocity. The specimen must at all times be completely in contact with the abradant, and the specimen and abradant must not be coaxial. The specimen may revolve about the center of the abradant with any angular velocity in the same direction as its rotation or in the opposite direction.

The simplest solution from mechanical considerations is the special solution in which both abradant and specimen rotate in the same direction and with the same angular velocity while the specimen does not revolve. A machine based upon this special solution has been constructed and found to operate satisfactorily for a wide variety of textile products.

A new feature of this machine is the abradant. It consists of a disk 4½ inches in diameter, in one face of which are inserted a series of parallel strips of clock spring, 0.025 inch thick and spaced ⅛ inch apart. The edges of these springs, ground and lapped to a plane surface, constitute the abradant for textile materials. Although tests indicate that the abrasive effect of this device remains constant, the abradant is, obviously, not uniform over its entire area. Any effect on the result of a test due to non-uniformity in the abradant is eliminated by rotating the abradant once more than the specimen in every 240 rotations.

Abrasion machines based upon the mathematical solution which has been derived have many advantages. The resistance to abrasion of many products, such as textiles, varies greatly with the direction of the abrasion because of structural differences due to the type of weave and the kinds of yarns and fibers used in the warp and in the filling. Since such machines can abrade plane areas of a specimen equally from every direction, the effect of fabric construction or "form factor" on the resistance to abrasion can be evaluated directly.

Why Industrial Hygiene in a Rubber Company?

(Continued from Page 322)

recent establishment of a Department of Industrial Hygiene, functioning as a part of the Medical Division of the company and directly responsible to the Medical Director, with laboratory and office space in the central Dispensary of the main plant.

Successful industrial hygiene requires the combined efforts of the medical, engineering, chemical, and nursing professions and it is believed the present arrangement enables this to be secured. A constant interchange of information, pertaining to occupational disease cases and the nature of the various manufacturing operations, occurs between the industrial hygiene department and the medical staff. Likewise a close liaison is maintained between the safety department and the workman's compensation department.

The industrial hygiene laboratory, when completed, will be adequately equipped to handle all of the various analytical determinations necessary for the field control work. Of course every needed facility of the present research and control laboratories will be utilized. It is not anticipated to duplicate such specialized equipment as x-ray diffraction units, spectrographs, ultraviolet spectrophotometers, etc. It is the hope of the company to provide all of its plants with the best industrial hygiene service possible. This in its United States and Canadian plants alone means an industrial population of approximately 45,000.

The B. F. Goodrich Company is not only a rubber manufacturing company but a chemical and plastics manufacturer as well. Consequently, the potential health hazards cover a very wide range. Many solvents, covering the entire gamut of the toxicologist's textbook are used. Many compounds of both toxic and dermatologic significance are employed. Of these, a few are of singular importance to the rubber industry, and of especial industrial hygiene interest. Styrene, acrylonitrile, and butadiene are typical examples.

Fortunately, for the most part, industrial hygiene and industrial toxicological research has progressed sufficiently to supply us with the necessary knowledge for controlling most industrial health hazards. However, in the newer, expanding industries, where today's laboratory curiosities may be tomorrow's production line or tank car products, constant toxicological research is necessary to supply the answers to proper employee health and consumer protection. The industrial hygiene department of the company is charged with the latter, as well as the former, responsibility, and for both of these reasons constant toxicological research is being carried on by Goodrich.

RECENT ADVANCES IN THE PHYSICS AND CHEMISTRY OF RUBBER

6—The Structure of Long Chain Polymers as Revealed by X-Rays

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British Rubber Producers' Research Association, Welwyn Garden City, Herts., England

IN this lecture I shall be attempting to answer in general terms the question as to what sort of information can be expected from an X-ray study of a polymeric material which will contribute to the knowledge of its fundamental structure, for this is after all the basis of all its chemical and physical behavior. As in most scientific research we should look for qualitative results first.

When a material has the property of diffracting an X-ray beam to produce an interference pattern which can be recorded on a photographic film, or, if the beam is sufficiently intense, observed on a fluorescent screen, then two conditions are fulfilled. The first, general to all matter, is that the distance apart of the atoms is of the same order of magnitude as the wave length of the X-rays, that is about 10^{-8} cm. or 1 Angstrom (this being a convenient unit in which molecular dimensions are described). The second is the special condition that the atoms are arranged in a regular and periodically repeating pattern. The specimen is in fact acting as a two or three-dimensional diffraction grating for the X-rays, giving rise to the spots of the diffraction pattern. The more regular and to some degree the more extensive the atomic order, the more sharply defined is the diffraction pattern.

Here then we have a means of diagnosing the degree of regularity or order in the spatial arrangement of the atoms or groups of atoms in the material, and, what is often more important from the physical point of view, it is possible by means of X-rays to study how the structural order varies with external conditions, having in mind particularly the technologically important factors of temperature and stress.

Natural rubber provides a classical example of this study of the change in internal structure with external conditions. Unstretched at room temperature the diffraction pattern is the diffuse halo, which has become familiarly associated with liquids and amorphous solids. The only order in the material is that each carbon atom has on the average two neighbors at a radial distance of roughly 1.5 Å, a further three at about 2.7 Å with more concentrations at 4 and 5 Å *(1)*. There is no long-range regularity of structure and this corresponds to the random and irregular arrangement of the long hydrocarbon chains molecules which is referred to as the amorphous state of the polymer.

Now if the temperature of the specimen is lowered to 0° C. and kept there for several days the state of the rubber changes, crystallization taking place to give the same type of X-ray diffraction pattern as does a finely ground crystalline powder, that is, a series of concentric rings. By analogy this is called a powder diagram, but the conception of a crystalline polymer must be rather different from that of an aggregate of a fine crystalline powder, because firstly it is impossible to isolate or grow a single crystal of a polymer and secondly the calculations of crystal size based on the width of the powder rings *(2)* show that the region of crystallinity is very much smaller than the overall length of a single molecule; for example, a rubber molecule of molecular weight 120,000 if fully extended will be about 10,000 Å long while estimates of the size of the crystalline region in frozen rubber give values of the order of 600 Å along the length of the chain molecules.

We are led therefore to infer that one long chain molecule can pass through and be part of several crystalline regions or 'crystallites.' Since crystallization will take place from several nuclei simultaneously there will always be some portions of the long chain molecules which are unable to align themselves into one or other of the ordered regions and hence we can never expect to get a polymer 100% crystalline.

From the experimental point of view, the X-ray data, which are limited mainly to the crystalline part of the material, can give no information about the total length of the molecule, that is, its true molecular weight, or about the structure of the ends of the chains.

Supposing now that instead of lowering the temperature the rubber is stretched, then at a certain extension which depends upon the previous history of the specimen, e.g., whether or how it was vulcanized, crystallization again takes place. When the rubber was frozen the thermal motion of the atoms was so reduced that the cohesive forces between the chains became dominant and caused portions of the adjacent molecules to become aligned. Now the molecules are aligned by the external stress. The straightening out of the chains assists the forces which cause the molecules, or rather portions of them, to form a regular crystal lattice. The difference between this form of crystalline structure and that produced by cooling is that the crystallites are now oriented with one particu-

Note: This paper is one of a series based on lectures delivered during 1945-46 by members of the staff of the British Rubber Producers' Research Association at Newton Heath Technical School, Manchester, or before the Leicester Section of the Institution of the Rubber Industry, or under the auspices of the Extra Mural Department of the University of Birmingham.

lar direction, that of the length of the molecular chains, along the direction of stretching.

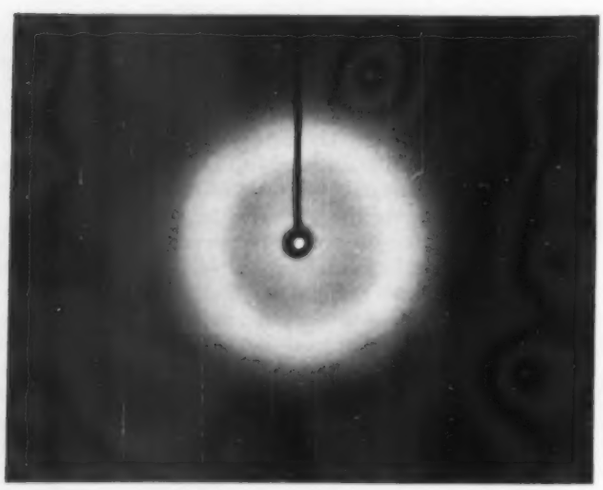
In the X-ray photograph, the diffuse halo of the amorphous state is replaced not by the rings of the randomly arranged crystallites as in frozen rubber but by the more or less well-defined spots of the stretched rubber 'fibre diagram.' The degree to which the diffraction pattern shows either the diffuse halo, the powder rings, the discrete spots, or an intermediate state such as rings with thickened arcs, is a measure of the crystallinity and the extent of orientation in the specimen. These properties may therefore be studied in a qualitative and to some extent quantitative way relative to the conditions of temperature and stress, for both varieties of rubber and other natural and synthetic long chain polymers.

Many of these materials are found to behave similarly to rubber in their crystallization but with different temperature scales. Gutta-percha, the stereoisomer of rubber, for example, gives the crystalline powder rings at room temperature and not until it is heated above 60°C. does it become rubbery and amorphous, exhibiting a diffuse halo pattern with X-rays. Then on fast and slow cooling, two different crystalline forms can be obtained respectively which are characterized by their different X-ray patterns.

Rubber hydrochloride similarly gives the ring pattern at room temperatures as do a number of the synthetics, for example, polythene and polyisobutylene, and in order to get a fibre diagram the specimen must be warmed before stretching or preferably, to avoid excessive plastic flow, rolled or cold-drawn into fibres.

On the other hand it is found that certain long chain polymers cannot under any circumstances be persuaded to give the crystalline X-ray diffraction patterns. The reason for this is often apparent from the chemical configuration of the molecule.

In synthetic polyisoprene, for example, instead of the exclusively regular head-to-tail polymerized product of the rubber tree there is also head-to-head junction of the isoprene units and sometimes branch chain formation, which means that there cannot be a regular repetition of atomic groupings along the length of the molecule whatever may be its orientation, and hence there can be no possibility of forming a crystalline structure. Similarly, for a molecule such as Buna S, a copolymer of styrene and butadiene, the conditions for the regular arrangement of atoms can never be attained.



Unstretched Rubber

The absence of crystallization in polystyrene suggests that this molecule also has an irregular configuration along the chain or a considerable amount of branch chain formation, although here the interpretation of evidence is complicated by the presence of the large phenyl groups which may be the decisive factor in inhibiting crystallization as are the acetate groups in polyvinyl acetate which itself does not crystallize but on hydrolysis will give a crystalline polyvinyl alcohol.

So much for the more qualitative aspect of the X-ray results. If a polymer fails to give a fibre diagram and remains amorphous under all conditions, then the amount of information that can be derived by X-ray methods is very limited. It is from the fibre diagram that structural information of a more quantitative nature is derived.

Let us suppose then, that, following the preliminary examination to discover the optimum conditions for orientation of the crystallites, an X-ray pattern is obtained with the fibre axis of the specimen arranged coaxially within a cylindrical camera. Under this experimental condition the diffraction spots on the photograph have a characteristic pattern in that they lie on "layer lines" at right angles to the direction of the axis of the camera. From the distance apart of these layer lines and the dimensions of the camera a simple calculation gives the identity period of the long chain molecule, that is, the dimensions of the structural repeating unit along the length of the molecule.

This is valuable information which is characteristic of the polymer structure and can under favorable circumstances tell us much about the general stereo-chemistry of the molecule. The identity period may correspond to the dimensions of one chemical monomer unit as in β-gutta-percha or polyvinyl alcohol, sometimes two as in rubber or polyvinyl chloride, while in polyisobutylene the crystallographic repeating unit is said to be $(\text{-C.}(CH_3)_2\text{.}CH_2\text{-})_8$.

Having determined the repeating pattern along the fibre axis, we now require some information about the lateral arrangement of the chain molecules in the structure. This is referred to two other crystal axes which may or may not be at right angles and whose lengths relate to the positions of the diffraction spots laterally across the layer lines. The determination of this lateral repeating pattern is not straight-forward as for the fibre direction since from the positions of the spots on the photograph at least three variables (two axis lengths and the angle between them) have to be fixed and an unambiguous answer cannot always be found. The problem may be simplified by the phenomenon of "higher orientation." If a rubber sheet is held between wide clamps so that on extension there is a reduction in the thickness but little change in width *(3)*, then not only is the fibre axis aligned along the direction of stretching but there is also a preferential orientation of one of the lateral axes into the plane of the sheet. A similar effect is obtained with rolled gutta-percha, polythene, and certain cellulose membranes, but not all polymers show it. If this higher orientation were complete the specimen would simulate a single crystal, or at least a twinned crystal, in its diffraction effects and the determination of the lateral axes would be as precise as for the fibre axis.

Unfortunately, only a limited measure of higher orientation can be obtained even with rubber which shows

the phenomenon the most markedly. Even so, although there may be some uncertainty about the finer details of the dimensions which define the unit cell of the crystalline polymer, the main features can often be well established. This is well illustrated by the results put forward by various workers for the unit cell of crystalline rubber. The more recent of these figures are as follows:—

	Fibre Axis	a	c	β
Lotmar and Meyer (*4*)	8.20Å	12.65Å	8.54Å	96°39′
Sauter (*5*)	8.20	12.60	8.91	90°
Morss (*6*)	8.15	12.4	8.9	90°
Bunn (*7*)	8.10	12.46	8.89	$\beta = 90°$ $\gamma = 92°$

The small variations in these values may well represent a limit of experimental error imposed by the difficulties in measuring accurately the positions of the rather large and diffuse spots that are obtained with present X-ray technique.

From the dimensions of the unit cell the number of long chain molecules passing through it can be calculated from the formula

$$n = \frac{V \cdot d \cdot N}{M_r}$$

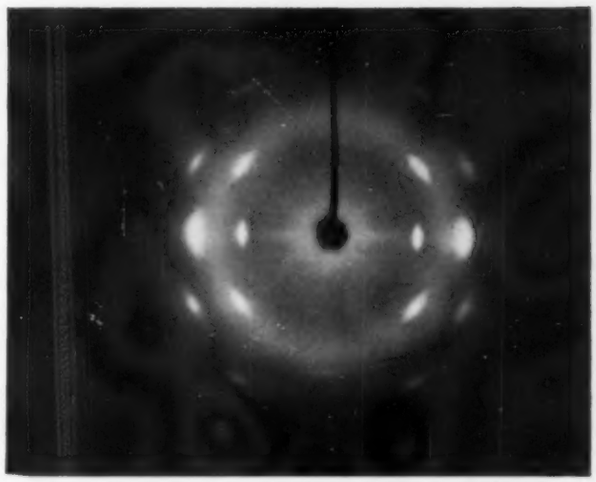
where V is the volume of the unit cell, d is the density of the crystalline polymer, N is Avogadro's Number, and M_r is the molecular weight of the repeating unit of the chain.

From the positions of the diffraction spots on the fibre diagram we can therefore measure the size of the unit cell of the crystalline structure and determine the number of molecular chains which pass through it, but we have as yet no information about the steric relationship between the chains or the relative positions of the individual atoms. This information is implicit in the diffraction spot intensities which have yet to be considered.

The deduction of the atomic positions from the observed intensities in the fibre diagram is not an easy and direct process for two main reasons. The first, which is fundamental to all crystal structure analysis, is that although there is a direct relationship between atomic coordinates and a quantity known as the structure factor (F) for each diffracted beam, this structure factor is a complex quantity consisting of an amplitude and a phase and since the intensities are proportional to F^2, only the amplitude and not the phase can be determined.

We cannot therefore calculate the atomic positions directly from the intensity values, although given atomic positions we can calculate what the corresponding intensities would be. If then we wish to convert the observations directly into a picture of the electronic distribution in the crystal structure the values of the phases of the structure factors must be arrived at by some other means.

The second difficulty is particular to polymer work, where the inability to obtain a single crystal orientation and the lack of definition in the spots makes it impossible to determine the intensity of each individual diffracted beam in the many cases where they overlap to form a large diffuse spot on the photograph. For example, many of the observed spots on the rubber fibre diagram actually correspond to three or four diffracted beams superimposed where they would normally be resolved in single crystal work.



Stretched Rubber

For this reason, the approach to the problem of solving a polymer structure is one of trial and error. From a background of stereochemical knowledge relating to the type of atomic groupings involved, which must include information about the interatomic distances, valency directions and intermolecular packing, a likely arrangement for both the atoms within the molecules and for the molecules within the unit cell is proposed. This trial structure is then tested by calculating the corresponding theoretical intensities and comparing them with those observed experimentally, and its validity rests on the measure of agreement found.

However, because the polymer X-ray data are always very limited as compared with that from a single crystal structure of similar complexity, the fact of good agreement between the observed and calculated intensities is not always sufficient to establish the finer details of molecular structure *(8)*, and these must depend for the present upon assumptions that the interatomic dimensions in the polymers are analogous to those found in related simple structures which can be studied with more precision. Even so, since there is always a direct relationship between the accuracy of the experimental data and that of the results, it is desirable that best use should be made of what is available.

Up to the present this limit has not been reached in polymer work mainly because it is found very difficult to make accurate quantitative intensity measurements from fibre diagrams. This appears to require special technique involving the use of crystal monochromators in conjunction with high-powered moving-target X-ray tubes and when these technical troubles are overcome it should be possible to revise with greater detail and accuracy much of the existing structural work on the synthetic and natural polymers.

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Editorials . . . . . .

Cleveland Meeting

SEVERAL innovations were introduced at the meeting of the ACS Rubber Division held in Cleveland last month. Most of them met with wide approval from the 1,000 registered members and guests and it is to be hoped that they will be continued as standard practice at meetings in the future. There was room for improvement in the method of handling the large crowds which division meetings attract, and both the present officers of the division and the members comprising the local arrangements committee are to be congratulated for the improvements introduced at Cleveland.

Two of the innovations which met with the outspoken approval of the membership were the limiting of technical papers to a maximum of 20 minutes for delivery and the grouping of papers by subject. Most of the papers were held down to 10 minute delivery, and in all cases at least five extra minutes were provided for discussion. In this manner a total of 34 technical papers were presented in four technical sessions, instead of the usual five or six sessions when so large a number of papers is involved. Nobody denies that it is extremely difficult to sit through three solid days of technical sessions, which has happened time and again in the past.

The grouping of papers by subject was an idea which should have been put into effect years ago. Few chemists attending a division meeting sit through every session and listen to every paper. Even though some chemists feel it their duty to listen to every paper, it is hardly within the realm of possibility that their interest in rubber covers all of the phases represented by the numerous papers submitted. Furthermore, one of the purposes of division meetings is to allow the chemists and technologists to get together outside of meeting rooms to discuss their mutual problems. At Cleveland, the first session was devoted to papers on compounding, the second to carbon black, the third to problems of chemistry, and the fourth to latex and other subjects, including testing and reclaimed rubber. Papers on a few other subjects were also presented and these were included at various sessions.

Grouping of the papers by subject enabled members and guests attending the Cleveland meeting to pick their spots. Since the program was rigidly adhered to as to scheduled time, thanks to Chairman Walter Vogt, those wishing to hear any paper or group of papers did so, without being required to listen to some paper in which they had only a minor interest if any. That the quality of the papers lived up to division standards was proved by the excellent attendance throughout each session. By all means, let's continue these innovations.

Cocktail Party

THERE was another innovation at the ACS Rubber Division meeting at Cleveland which merits some comment on its own. That was the Suppliers' Cooperative Cocktail Party, held at the Carter Hotel just before the divisional banquet. All members and guests attending the meeting were invited to the cocktail party, and well over 1,000 were present.

There were admittedly a few mistakes made in the handling of this cooperative affair. In the first place, the Banquet Room of the Carter Hotel cannot satisfactorily handle 1,000 people, and so it was rather difficult to move around. Secondly, only one bar was provided at the beginning of the party (a second being subsequently set up), and those seeking refreshments found it rather difficult to either fill or refill their glasses.

But these are errors easily rectified. Experience is still the best teacher. The point is that a cooperative party preceding the banquet brings all members and guests together at a central spot and suppliers do not have to vie with one another for the attention of their mutual customers. Companies wishing to provide special facilities can still do so after the banquet if desired.

Paris Conference

THE International Rubber Study Group will hold its fourth meeting in Paris early next month. For the first time delegates of rubber consuming countries other than member countries have been invited to attend, but few are expected. The Study Group is primarily concerned with statistics, and the rubber statistical picture has changed considerably since the last meeting of the group at The Hague. The supply of natural rubber is gaining by leaps and bounds —Malaya alone having shipped over 90,000 long tons in May—and consumption requirements give evidence of tapering off. The price of natural rubber, contrary to predictions, has fallen sharply since the free importation of such rubber into the United States was allowed. Malayan planters are viewing the situation with growing alarm since there is a possibility that the Netherlands East Indies may soon re-enter the world rubber market. There is little doubt that delegates to the Paris Conference will be asked to consider some new form of international regulation. The conference should prove most interesting.

CURRENT NEWS OF THE MONTH

SHARP DROP IN RUBBER PRICE LEADS TO FERVENT PROTESTS

A sharp drop in the price of natural rubber in the Far East during the past month has resulted in considerable agitation on the part of Far Eastern planters. Contrary to the expected increase in price following the resumption of free trading in the United States, the price dropped from a high of 43 Malayan cents (approximately 22 cents) to 29½ Malayan cents (approximately 15 cents). The market has given some indication of strengthening within the past few days.

Chinese rubber interests in Malaya have initiated a move for the British Government to appeal to the International Trade Conference at Geneva and also direct to Washington for new international rubber agreements. The United Planting Association of Malaya has recommended to its member firms that a 20% reduction in wages paid to tappers be initiated immediately to counteract the drop in price.

The majority of plantation interests in Malaya place the blame for the current recession in Malayan rubber prices directly upon the American policy regarding synthetic rubber. These interests point out that although the free market is now operative in the United States, in effect the United States Government "is still maintaining its policy in all respects with the exception that the Government has ceased to be a monopoly importer." They emphasize the fact that the United States Government still allocates rubber after importation and still dictates how much synthetic and how little natural rubber American manufacturers shall use.

Additional Charges Made

In addition to placing the onus for the present price situation on the American synthetic rubber policy, Far Eastern growers also attributed the drop to market manipulation in New York, panic selling among small dealers in Malaya, and possible overproduction. One authority is quoted as stating that "only a matter of about 20,000 tons in Malaya is upsetting the equilibrium of the market at this end."

In the United States, government officials generally attributed the decline to two factors: (1) because purchasers in this country expected a price rise after the RFC stepped out of the natural rubber market, they held off buying to see what would happen; and (2) the wave of "scare selling" started in Malaya by small traders. Prior to the lifting of American controls, many small traders, mostly Chinese, bought up stocks of rubber in the belief that prices would skyrocket after the controls were lifted. When prices failed to rise, these traders, most of them handicapped by limited capital, began unloading their rubber, this movement starting the price decline.

American rubber manufacturers are in general agreement that falling world prices are the result of the increased supply of natural rubber plus record tire production which has been rapidly catching up with demand in the United States. These manufacturers predict a further price decline later this year after production in the Netherlands East Indies opens up as expected. As indicated elsewhere in this issue, the record tire production is leading toward sharp reductions in the retail price of tires.

There is some talk that the question of price control may be added to the agenda at the next meeting of the International Rubber Study Group which will be held under the auspices of the French Government in Paris next month. In accordance with the decision reached at the last meeting of this group at The Hague in November, 1946, a number of additional countries have been invited to attend the Paris conference including Canada, Brazil, Italy and several of the Central European countries. Not all of these countries are expected to send delegates.

British Stockpile Burns

At least 15,000 tons of natural rubber, part of England's rubber stockpile, were destroyed by fire on June 3. The fire, which broke out at the Micham warehouse near London, and which raged for several hours, was finally brought under control by 450 firemen and civilian bucket brigades. It was estimated that 500,000 potential tires were lost as a result of the fire which was reminiscent of that suffered by the Firestone Rubber & Latex Products Co. at Fall River, Mass., a few years back.

Vanderbilt to Open Talc Mine

R. T. Vanderbilt Co., 230 Park Ave., New York 17, N. Y., has announced plans to mine talc, which is widely used in the rubber industry, on a site it has leased in New York State. The talc mine is located approximately 35 miles northeast of Watertown, N. Y.

RUBBER POLICY LEGISLATION SEEN DEFERRED BY CONGRESS

According to informed Washington sources, enactment of legislation establishing a permanent national rubber policy will in all probability be delayed until the next session of Congress. Although government and industry leaders agree upon the need for early adoption of a long-range rubber program, at the same time they admit that unwise haste in settling the matter could lead to extreme difficulties later.

Inquiries in Washington confirm the belief that the present session, in view of the few remaining months before adjournment and the many bills on the docket, will not be able to consider rubber legislation until it reconvenes next January. It is considered likely that both the industry and all Government agencies will have agreed by that time on the salient features of the rubber policy.

Some Congressional leaders have indicated that an all-embracing bill will be submitted to Congress in January, with extensive hearings following immediately. Enactment into law is expected before March 31, 1948, when Government controls on allocations, specifications, and inventory expire.

Congressional committees have not yet reached the stage of their inquiry into the rubber question where they are in a position to offer any formal legislation. The House Armed Forces Services Committee met informally on May 8 with representatives of the rubber industry. Among those present at the meeting were J. J. Newman, vice-president of the B. F. Goodrich Co.; L. R. Jackson, vice-president of the Firestone Tire & Rubber Co.; R. S. Wilson, vice-president of the Goodyear Tire & Rubber Co.; H. W. Hendrickson, president of the American Hard Rubber Co.; and William Welch, president of the Midwest Rubber Reclaiming Co.

Mr. Newman and Mr. Jackson indicated at the committee meeting that tires and camelback should consume most of the synthetic rubber production, while Mr. Jackson also thought that non-transport uses should be explored further. They said that this would make GR-S enforced consumption less complicated, thus requiring little or no government supervision.

Representatives of the U. S. Departments of Commerce and State present at the meeting argued that GR-S consumption should be spread, not confined to tires. This would stimulate wider development of its use.

CLEVELAND MEETING OF ACS RUBBER DIVISION ATTRACTS 1,000

One of the best attended spring meetings of the Division of Rubber Chemistry, A.C.S., was held at the Hotel Cleveland in Cleveland, Ohio, on May 26, 27 and 28. Registered attendance reached the exact figure of 1,000. All of the technical sessions were well attended and the divisional banquet, a feature of each meeting, drew well over 1,000.

Technical sessions were held on the afternoon of May 26, the morning and afternoon of May 27, and the morning of May 28. In all, 34 technical papers were presented, abstracts of which were published in our preceding issue. Two innovations featured the presentation of these papers; first, with one or two exceptions, delivery was restricted to 10 to 15 minutes, and second, the papers were grouped by subject. Both of these innovations were welcomed by the membership.

Business Meeting Held

The meeting was officially opened with a few remarks by W. W. Vogt (Goodyear), chairman of the division. At a brief business meeting, held at the end of the first technical session, J. H. Fielding (Goodyear), chairman of the Membership Committee, reported that 394 new members had joined the division since the last meeting, of which the Membership Committee had secured 226. Total membership as of March 15, it was stated, amounted to 1,844, of which 1,587 were regular members and 257 associate members.

Harry Outcault (St. Joseph Lead), vice-chairman of the division and liaison officer with the local rubber groups, reported on some of his activities with the local groups in the past several months. He reviewed measures of cooperation which had been undertaken between the division and the local groups, and suggested that any member wishing to deliver addresses before any of these groups communicate with him. The availability of such speakers, and their topics, are reported to the local groups by means of a special monthly newsletter.

It was also announced during the meeting that the Fall Meeting of the Rubber Division will be held at the Hotel Commodore in New York City on Wednesday, Thursday and Friday, September 17, 18 and 19. Abstracts of all papers intended for presentation at the meeting should be in the hands of the division secretary no later than July 11. The secretary is Charles R. Haynes, of the Binney & Smith Co., 41 East 42nd St., New York 17, N. Y.

The division held its usual luncheon meeting with officers of sponsored local rubber groups on May 28, with Harry Outcault presiding. A general discussion on the handling of local meetings followed the luncheon, at which approximately 20 were present. It was stated at this meeting that the Philadelphia Rubber Group is now included among the sponsored groups.

Banquet Held at Carter

The divisional banquet was held on the evening of May 27 at the Hotel Carter. It was preceded by a Suppliers' Cooperative Cocktail Party, also held at the Carter, another innovation at division meetings. Outside of the fact that quarters were rather cramped for the large crowd attending, and bar facilities were inadequate for the same reason, the cooperative effort was approved by a large majority.

Featured speaker at the banquet was Charles W. Carvin, vice-president of the Industrial Rayon Corporation of Cleveland. Interspersing his remarks with many well-received stories slightly on the spicy side, Mr. Carvin recalled the part played by rayon in making heavy-duty synthetic rubber tires possible. He briefly reviewed the history of the rayon industry, which he attributed to constant research, and called for American industry to keep their research programs operating at the same high speed that prevailed during the war. The banquet also featured an excellent variety stage show.

Special thanks are due to members of the Local Arrangements Committee for an exceptionally smooth-running meeting. This committee was headed by Allyn I. Brandt, of the B. F. Goodrich Chemical Co., as chairman, and included C. J. Harwick (Harwick Standard Chemical), C. P. Hall (C. P. Hall Co.), H. W. Brinkerhoff (Goodrich Chemical), C. W. Christensen (Monsanto Chemical), C. A. Smith (N. J. Zinc), and Dr. William von Fischer (Case School).

Contributing Companies

The Suppliers' Cooperative Cocktail Party was made possible by donations received from dozens of companies, approximately $5,000 being accumulated. Companies making the party possible included the following:

Adamson United Co., Advance Solvents & Chemical Corp., Akron Chemical Co., Akron Paint & Varnish Co., Akron Standard Mold Co., Aluminum Company of America, Aluminum Flake Co., American Cyanamid Co., American Zinc Sales Co., Armour & Co., Baker Castor Oil Co., Barnsdall Oil Co., Barrett Division, Biggs Boiler Works Co., Binney & Smith Co., Stewart Bolling & Co., Bridgwater Machine Co., Brooklyn Color Works, Inc., Brown Co., Godfrey L. Cabot, Inc., Caldwell Co., Carbide & Carbon Chemicals Corp., Carter Bell Mfg. Co., Celanese Chemical Corp., Central Rubber & Steel Corp., Cleveland Liner Mfg. Co., Commercial Solvents Corp., Continental Carbon Co., Continental-Mexican Rubber Co., Curran & Barry.

Also Dill Mfg. Co., B. E. Dougherty Co., Dow Chemical Co., Dow-Corning Corp., E. F. Drew & Co., E. I. du Pont de Nemours & Co., Eagle Picher Co., Eastern Magnesia Talc Co., Enjay Co., Erie Engine & Mfg. Co., Russell Farley Co., Farrel Birmingham Co., General Atlas Carbon Co., General Latex & Chemical Co., General Magnesite & Magnesia Co., Genseke Brothers, Givaudan-Delawanna, Inc., B. F. Goodrich Chemical Co., Goodyear Tire & Rubber Co., C. P. Hall Co., Hardesty Chemical Co., Harshaw Chemical Co., Harwick Standard Chemical Co., Herron Bros. & Meyer, J. M. Huber Corp.

Also Imperial Paper & Color Corp., *India Rubber World*, Industrial Rayon Corp., Chas. Eneu Johnson & Co., Johnson Rubber Co., Douglas P. Johnstone, J. A. Kendall, E. P. Lambert Co., McNeil Machine & Engineering Co., Miami Boiler & Machine Co., Midwest Rubber Reclaiming Co., Monsanto Chemical Co., Moore & Munger, H. Muehlstein & Co., National Rubber Machinery Co., National Sherardizing & Machine Co., National Standard Co., Naugatuck Chemical, Neville Chemical Co., New Jersey Zinc Co., Ohio Apex, Inc.

Also Pennsylvania Industrial Chemical Corp., Pequanoc Rubber Co., Phillips Petroleum Co., Piqua Stone Products Co., Pittsburgh Plate Glass Co., Rare Metal Products Co., Raw Materials Co., Rayon Processing Co., Resinous Products & Chemical Co., Ridbo Laboratories, Inc., B. W. Rogers Co., Rubber Age, St. Joseph Lead Co., Schibley & Ossman, A. Schrader's Son, Scott Testers, Inc., A. Schulman, Inc., Seiberling Latex Products Co., Sharples Chemicals, Inc., Shell Chemical Corp., Shell Oil Co., Skelly Oil Co., S. S. Skelton, Werner G. Smith Co., V. L. Smithers Laboratories, Stamford Rubber Supply Co., Standard Oil Co. (Indiana), Stauffer Chemical Co., Struthers Wells Corp., Sun Oil Co., Synthetic Products Co.

Also Tanney-Costello, Inc., Thiokol Corp., Titanium Pigment Corp., United Carbon Co., U. S. Rubber Reclaiming Co., R. T. Vanderbilt Co., Wetherbee Chemical Co., J. J. White Products Co., Whittaker, Clark & Daniels, Inc., C. K. Williams & Co., Wilmington Chemical Corp., Witco Chemical Co., Xylos Rubber Co.

Plastoflex No. 5 Plasticizer

A new, relatively non-volatile plasticizer has been developed by the Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y., for polyvinyl chloride, polyvinyl chloride-acetate, polyvinyl butyral, nitro-cellulose, polystyrene, and acrylic polymers. Known as Plastiflex No. 5, the material has a crystallizing point of 38° C., a specific gravity at 25/25° C. of 1.056, a boiling range at 4 mm. of 206° C. to 236° C. and at 760 mm. of 365° C. to 383° C., and a viscosity at 25° C. of 400 centipoises. Compounds incorporating the material are said to have excellent hot strength properties and do not become "short" on the calender at elevated temperatures.

SHARPLES CHEMICALS STARTS HANDLING ULTRA ACCELERATORS

As announced last month, Sharples Chemicals, Inc., of Philadelphia, Penna., has organized a rubber sales division, with George R. Lawson as manager of the new division. It has since been announced that effective July 1, the company will begin the direct distribution of ultra accelerators to the rubber manufacturing industry. Personnel of the new rubber sales division has also been revealed.

For the past five years, according to Sharples Chemicals, Inc., it has been the major producer of ultra accelerators in the United States. It has also been the major manufacturer of aliphatic amines from which the ultra accelerators are synthesized. The Sharples line of ultra accelerators includes six types and 10 separate grades. Designated as "Sharples Accelerators," with number appendixes indicating the type, the line consists of the following:

Accelerator 52 (tetramethylthiuram disulfide), Accelerator 62 (tetraethylthiuram disulfide), Accelerator 57 (zinc dimethyldithiocarbamate), Accelerator 67 (zinc diethyldithiocarbamate), Accelerator 77 (zinc dibutyldithiocarbamate), Accelerator 66 (selenium diethyldithiocarbamate). Accelerator 52 is available in three grades, Accelerators 57 and 67 in two grades each, and Accelerators 62, 66, and 67 in one grade each.

In addition to the ultra accelerators, the division will also handle the sale of other materials made by Sharples for the rubber industry. These include vulcanizing agents (alkylphenol sulfides), solvents (amyl chlorides and dichloropentanes), plasticizers (alkylphenols, alkylnaphthalenes, and plasticized gilsonite), and anti-sunchecking wax. The company also makes intermediates for rubber chemicals, including ethylamines, butylamines, and isopropylamine, as well as a polymerization controller.

Personnel of New Division

Including Mr. Lawson, the new Sharples rubber sales division is composed of six technically-trained men of wide experience and recognized standing in the rubber industry. These include Bryant C. Ross, Eastern Manager; George J. Klein, Akron District Manager; Kenneth B. Cary, Wire and Cable Sales; Lloyd E. Parks, West Coast Representative; and B. S. Garvey, Jr., Laboratory Director. The new division has at its command a research and development laboratory in Wyandotte, Mich., including a completely-equipped rubber laboratory, and a sales service laboratory in Trenton, N. J. A biography of Mr. Lawson, manager of the division, appeared in our previous issue. Biographies of the five other men comprising the personnel of the division follow herewith:

Benjamin S. Garvey, Jr.: Born in Cambridge, Mass., in 1900, Dr. Garvey received his B.S. degree in 1921 and M.S. in 1925 from the University of Illinois, and his A.M. and Ph.D. degrees from Harvard University in 1926 and 1927, respectively. After serving as an instructor in chemistry at Boone University, Wuchang, China, from 1921 to 1924, he returned to this country to serve as assistant in chemistry at the University of Illinois for one year. In 1927, he joined the B. F. Goodrich Co. as a research chemist. He served in that capacity for fifteen years, working on Koroseal, brass plating, accelerators, rubber cements and chemical reactions of rubber. He was appointed technical manager of synthetic rubber for the B. F. Goodrich Chemical Co. in 1942, supervising three plants operated by the company for the Office of Rubber Reserve. In 1945 he was named technical service manager of rubber chemical sales for Goodrich Chemical.

Bryant C. Ross: Born in New York City in 1909, he attended grammar and high schools at Ramsey, N. J. He joined the R. T. Vanderbilt Co. in Jersey City, N. J., in 1926, and was transferred to Norwalk, Conn., in 1930, when the Vanderbilt laboratory was built there. In 1942, Mr. Ross was assigned as assistant to the chief of the Synthetic Rubber Section, Chemicals Branch of the War Production Board. After leaving Vanderbilt in 1944, he became president of Hamilton Laboratories, Hamilton Square, N. J., joining Sharples in March, 1947.

Kenneth B. Cary: Born in Utica, N. Y., in 1907, he was graduated from Rensselaer Polytechnic Institute, Troy, N. Y., in 1929 with a degree in chemical engineering. Joining the Okonite Co. as a chemist, he was appointed chief rubber chemist of the company in 1933. Four years later he became associated with the R. T. Vanderbilt Co. in charge of sales to the insulated wire and cable industry. In 1945 he became vice-president of Hamilton Laboratories, from which position he joined Sharples.

George J. Klein: Born in Vincennes, Ind., in 1902, he attended local grammar and high schools in Vincennes and graduated from high school there in 1920. Upon graduating from the School of Chemical Engineering of Purdue University in 1924, he joined the B. F. Goodrich Co. in Akron. He left Goodrich in 1936 and became connected with Herron Bros. & Meyer in a technical and sales capacity, leaving there to join Sharples early in 1947.

Lloyd E. Parks: Born in Lexington, N. C., in 1915, he received his B.S. degree from the University of North Carolina in 1938, his M.S. from the Georgia School of Technology in 1940, and Ph.D. from the University of Maryland in 1943. He joined the Sharples research department at Wyandotte, Mich., in 1943, working on lacquer, pharmaceutical and agricultural chemicals, and rubber accelerators. For the past year and a half he has been technical representative of the company's Chicago, Ill., office.

Personnel of the new Rubber Sales Division established by Sharples Chemicals.

FLORY TALKS ON HIGH POLYMERS IN ACCEPTING BAEKELAND AWARD

The chemical kinship of such seemingly diverse substances as vulcanized rubber, paint, films, and gelatin desserts has been established by recent research on complex molecular structure of high polymers, Dr. Paul J. Flory, head of fundamental research of the Goodyear Tire & Rubber Co., said in accepting the Leo Hendrick Baekeland Award of the New Jersey Section, A.C.S., at the Essex House in Newark, N. J., on May 12.

Speaking on "Basic Concepts in Polymer Science," Dr. Flory pointed out that not until fifteen years ago did chemists find out that high polymers are giant chemical structures, and that their unique properties stem solely from the size of their molecular structure. Early investigators expected each high polymer to be composed of the same kind of chain, but it is now known that the chains vary greatly in length, even when all the links are identical molecules, he said.

The situation was said to be even more complex in the case of a copolymer. In the many hundreds of thousands of tons of GR-S that have been produced, the Goodyear chemist stated, it is unlikely that any two of the chains have been identical, adding that this statement would hold true even if the amount of synthetic rubber equaled the size of the earth itself. The chains may contain a few hundred units, as in the case of nylon, to as many as 10,000 or even 100,000 units, as in the instance of certain rubber substitutes. On the 100,000,000 magnification scale they would be from 50 feet to a mile or two in length. These latter dimensions would be within the range of the microscope were it not for the slender width of the chains.

It is now known, Dr. Flory continued, that these giant chain molecules do not choose to straighten themselves to full length, but prefer to coil irregularly, intertwined with one another so that at proper magnification the aggregate of polymer molecules might resemble a huge plate of spaghetti, wriggling ceaselessly under the influence of thermal agitation.

Discusses Polymerization

Discussing polymerization, the speaker asserted that the great size of the polymer molecule does not affect its chemical reactivity. While the seat of reaction is confined to one spot, usually the end of the chain, this spot or chemical group reacts as if it were unaware of the bulky long chain behind it. Dr. Flory then presented this interesting explanation of polymerization: "Some polymers are formed by chain reactions. Here a molecule becomes activated by a catalyst, then successively gobbles up monomers one after the other in rapid succession, forming them into a giant chain as the process proceeds. Synthetic rubber molecules are formed in this manner. Other polymer molecules form by mutual coalescence, the molecules being linked end-to-end successively until very long chains are formed."

Formation of polymers of the "fish net" type was said to be characterized by a sharp gel point, after which the polymer is no longer fusible and soluble. Its strength and durability are increased, but it can no longer be molded into any other shape once gelatin has occurred. The gel point has been identified as that instant at which the continuous network structure begins to form.

Dinsmore on Program

Among the other speakers at the meeting was Dr. R. P. Dinsmore, vice-president in charge of research and development of the Goodyear Tire & Rubber Co. In his talk, Dr. Dinsmore evaluated the importance of basic research. He pointed out that much of the work of purely scientific problems was being carried on in industrial laboratories, and that corporations have moral duties to the society which supports them.

A part of this moral obligation was said to resolve itself to devote some research effort to the broad advancement of the arts in which we are engaged, if not directly to the sciences from which those arts must show a large measure of future development.

IVAN V. WILSON, who has been manager of the coating sales development department of the Monsanto Chemical Co., has been named assistant director of research of the company's Merrimac Division.

Coming Events

June 20. Akron Rubber Group, Outing, Turkeyfoot Golf Club and Sandy Beach Park, Akron.

June 27. New York Rubber Group, Annual Outing, Blasberg's Grove, Hawthorne, N. J.

June 27. Boston Rubber Group, Annual Outing, Woodland Golf Club, Newton, Mass.

June 27. Detroit Rubber & Plastics Group, Outing, Forest Lake Country Club, Pontiac, Mich.

July 19. Chicago Rubber Group, Outing, Acacia Country Club.

Aug. 5. New York Rubber Group, Golf Tournament, Winged Foot Golf Club, Mamaroneck, N. Y.

Sept. 17-19. Rubber Division, A.C.S., Fall Meeting, Hotel Commodore, New York City.

Sept. 18. Southern Ohio Rubber Group, Dayton, Ohio.

Sept. 27. Connecticut Rubber Group, Outing, Eichner's Grove, Trumbull, Conn.

Oct. 3. Boston Rubber Group, Hotel Somerset, Boston.

Dec. 12. Boston Rubber Group, Xmas Party, Hotel Somerset, Boston.

Dec. 18. Southern Ohio Rubber Group, Dayton, Ohio.

GERMAN RUBBER DEVELOPMENTS COVERED IN NEW OTS REPORTS

Many of Germany's wartime developments in synthetic rubber and plastics are evaluated by five German chemists in two reports for sale by the Office of Technical Services, Department of Commerce. The reports, which stress butadiene rubber processes and also include information on glues, molding powders, plasticizers and vacuum fractionation, were obtained by British investigators in interviews with Dr. Eisenmann of Troisdorf Dyanamit, and Drs. Becker, Stocklin, Casper, and Mr. Mersh of I. G. Farbenindustrie.

The newer German synthetic rubber processes developed toward the end of the war were mainly laboratory developments. Dr. Becker reported favorably on a combined oxidizing and reducing agent using oxygen as the catalyst. He reported that peroxidase obtained from potatoes and monosulfuric acid proved in tests to have no advantage as catalysts. Other subjects on which he provided interesting information include triple polymers, regulators, chain terminators and oil resistant polymers.

Dr. Becker considered Buna S3, the best type of synthetic rubber produced in bulk, capable of further improvement. He stressed the advantage of long chain products without much side-branching because of their superior elasticity and elongation. The abrasion resistance of acid buna, he said, would be of value in the tread of a natural rubber tire casing.

Dr. Stocklin discussed the bonding of buna to metals, stating that the "Desmodurs" are said to be satisfactory with magnesium alloys and that the only metal treatment necessary is sandblasting followed by a gasoline wash. He provided considerable information on German production of various types of synthetic rubber, tackifiers and plasticizers.

Dr. Casper and Mr. Mersh stated that absolute pressure of fractionation units can be obtained by steam ejection either alone or "backed" by cylinder pump. They did not consider pneumatic controllers as good as electrically operated valves for controlling vacuum.

Dr. Eisenmann recommended a 50 percent solution of toluene sulfonic acid in water as the plasticizer for cold setting glues. In the urea and melamine-formaldehyde field he recommended a mixed molding powder which gives a "cake" instead of a powder.

Orders for the reports, entitled "Chemistry of Polymerization as Applied to the Preparation of Buna Synthetic Rubbers: Interview with Dr. Becker" (PB-49192; 12 pages; microfilm, $1; photostat, $1) and "Interrogation of Dr. Caspar, Dr. Eisenmann, Mr. Mersh, and Dr. Stocklin" (PB-49986; 6 pages; microfilm, $1; photostat, $1), should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

IMPORTANCE OF CARBON BLACK STRESSED IN VENUTO LECTURES

The history and importance of colloidal carbons (carbon black) and the proper utilization of such carbons were stressed in a series of lectures delivered during the week of April 21 before several local sections of the American Chemical Society by L. J. Venuto, research director of the Binney & Smith Co. The lectures were presented to the University of Michigan, Midland and Kalamazoo sections, all of Michigan, and to the St. Joseph Valley (Indiana) and Toledo (Ohio) sections.

In these lectures Mr. Venuto pointed out that the first manufacture of carbon black by the impingement method took place around 1870. Since its very modest inception, sales and production have reached the enormous figure of over 600,000,000 pounds per year. The furnace type of blacks recently have attained great importance and have raised the total carbon black production to a rate of over one billion pounds per year.

The bulk of this production is consumed by the rubber industry but an important tonnage is used in ink, paint and paper. Specialty grades are used for printing ink and the finer particle sized intense color type for paints and enamels.

Discussing the manufacture and characteristics of the colloidal carbons, Mr. Venuto stated that they are essentially elemental carbon varying in fixed carbon content. They are made from natural gas by the impingement method (channel), the free flame process (furnace), and direct cracking of gas without combustion (thermal).

They are particularly notable for their small particle diameters which range down to less than 10 millimicrons as measured by the electron microscope. The particles form typical colloidal sols and display active Brownian movement. They carry a definite particle charge and have a typical cataphoretic velocity under an impressed voltage.

Properties and Characteristics

Colloidal carbons possess adsorption properties and striking pH characteristics. As a rubber reinforcing pigment, colloidal carbon is superior to all other pigments. Colloidal carbons also show specific adsorption of substance in solution, an activity that surpasses in some cases even some of the activated charcoals.

This adsorptive behavior is related to the chemistry of the surface and can be demonstrated if the carbon is given suitable heat treatment before adsorption testing. Deactive heating (in absence of air) decreases alkali adsorption and increases acid adsorption. The amount of this change varies for different carbons. The conclusion from studies of this nature is that selective adsorption of alkali by carbons is due to their content of combined oxygen or CxOy complex.

The adsorption effect of carbon black influences the vulcanization rate of rubber, the drying of paint and ink films and dispersion in various media (where this property is turned to a definite advantage). Hydrolytic adsorption phenomena also lead to interesting conclusions.

L. J. Venuto

In rubber, paint and other industries, Mr. Venuto stated in his lectures, the maximum effectiveness or utility of the colloidal fineness of carbon black is attained only with difficulty unless proper dispersion is obtained. Experience in these industries has led to the development of high viscosity dispersion methods, use of dispersing agents, selection of compatible media where possible, formula adjustments for specific dispersing mills and combinations of the above.

Colloidal carbon has generally been regarded as chemically inert, yet, if one part is boiled up with from 3 to 10 parts of distilled water, cooled and the supernatant liquid decanted, the sludge when placed in contact with the glass electrode of a pH meter will give a characteristic reading of the material. Different carbons will show pH values ranging from 2.6 to 10 depending on the amount of volatile matter on the surface—the higher the volatile content the lower the pH value.

In paint and ink media the influence of the CxOy properties on pH is important. A high CxOy content serves as a natural dispersing agent and makes the carbon disperse more readily in most vehicles. A low CxOy content indicates better electrical conductivity of the carbon. In addition to the surface chemistry and surface area properties of colloidal carbons, there is a difference in the tendency of the carbon particles to adhere to each other in clumps or a chain-like network structure.

In concluding his lectures, Mr. Venuto pointed out that although colloidal carbons find particular use in the rubber, paint and ink fields, they are also used in other industrial fields.

MANUFACTURERS AND RETAILERS REDUCE PASSENGER TIRE PRICES

A major reduction in passenger car tire prices, one of the biggest since before the war, was announced by four tire manufacturers, three of the nation's leading mail order houses, and three New York department stores in recent weeks. Sears, Roebuck & Co., Montgomery Ward & Co., and Spiegel, Inc., were the first to cut passenger car tire prices, the reductions averaging between 12% and 12½% at their retail stores throughout the country. There was no indication at the time whether the price reductions were permanent or temporary.

Three New York City department stores, R. H. Macy & Co., Gimbel Brothers, and Abraham & Straus, Inc., announced special tire sales several days later, cutting passenger car tire prices approximately 15% below the prices set by the mail order houses. Spokesmen for the New York stores indicated that the sale prices probably would last until the present stocks of tires were cleared.

Dayton Rubber Co. and the B. F. Goodrich Co. followed the announcement of these tire sales with price reductions of their own, Dayton Rubber reducing the distributors' buying price of the company's tires by 2½%, and Goodrich cutting the retail list of prices for passenger car tires and tubes manufactured by the company. The new price for the Goodrich 6.00-16 Silvertown was set at $14.40, as compared with the previous price of $16.60, exclusive of Federal excise tax.

Reasons for Cut Cited

A spokesman for Goodrich stated that this first post-war price reduction by the company was being made in spite of the fact that the cost of both materials and labor are millions of dollars higher than were pre-war material and labor costs. Main factors for making price reductions at this time, he said, are expectations of increased manpower efficiency, anticipated lower material costs, and a forecast of a continuing relatively high level of production and sales. This general reduction of prices was said to bring all popular prices of the company's passenger car tires below pre-war prices.

Later, the U. S. Rubber and Goodyear Tire & Rubber companies also announced price reductions on tires and tubes, ranging from 4 to 25 per cent. U. S. Rubber made public price cuts of 4 to 11 per cent on its regular line of U. S. Royal tires, with the largest reductions in popular sizes, while Goodyear announced reductions ranging from 4 to 25 per cent. The 6.00 x 16 Goodyear DeLuxe passenger car tire has been reduced 10½ per cent to $15.65, including $1.16 excise tax.

Officials of the Firestone Tire & Rubber, General Tire & Rubber, and Seiberling Rubber companies have indicated that they have no immediate plans to reduce tire and tube prices.

CONNECTICUT GROUP HEARS TALKS BY WAKEFIELD AND JARGSTORFF

H. F. Wakefield and G. W. Jargstorff, development engineers of the thermosetting division and thermoplastics division, respectively, of the Bakelite Corp., were the principal speakers at the Spring Meeting of the Connecticut Rubber Group, held in the auditorium of the United Illuminating Co. in New Haven, Conn., on May 9. Approximately 150 members and guests heard Mr. Wakefield discuss "Plastics and the Rubber Industry," and Mr. Jargstorff talk on "Vinyl Elastomers for Extrusion and Molding."

In his talk, Mr. Wakefield pointed out that non-thermosetting Bakelite resins are useful as plasticizers and tack producing agents with synthetic rubbers, especially the nitrile types. Certain thermosetting resins were said to have proven extremely valuable in bonding systems to adhere rubber to steel as well as to wood, glass, and other surfaces.

The use of resorcinol-formaldehyde resins, both substituted and unsubstituted, as modifying agents in the compounding of synthetic rubbers, has given the compounder a new and valuable tool, Mr. Wakefield declared. For example, when concentrations of approximately 100 parts of resorcinol-formaldehyde resins are compounded with 100 parts of nitrile rubber, the resultant product is tough, abrasion resistant, and leathery. More flexible products with good durability characteristics can be produced using lower percentages (approximately 10% to 15%) of resorcinol-formaldehyde resins.

Mr. Jargstorff, the second speaker, indicated that vinyl resin compositions, particularly VYNS, composed of about 90% vinyl chloride and 10% vinyl acetate, and VYNW, composed of 95% vinyl chloride and 5% vinyl acetate, are now being widely used for the production of molded and extruded products covering a wide range of physical properties. VYNW was said to yield a more rubbery product than VYNS with more resilience and abrasion resistance.

Production of vinyl resins is increasing at a rapid pace and is expected to reach 250,000,000 pounds annually by 1949, according to the speaker. At present about 15% of all synthetic resins consumed are vinyls.

Discussing compounding ingredients for the vinyls, Mr. Jargstorff stated that by using tricresyl phosphate plasticizer and antimony oxide, compounds with excellent fire resistance can be produced. Compounds with lower concentration of fillers are more fire resistant than those with high loadings. Dioctyl phthalate has proven to be the best plasticizer and precipitated calcium carbonate the best filler.

Lead stearate and basic lead carbonate were said to be valuable as stabilizers to prevent degradation of vinyl resin at elevated temperatures, the former acting as a release agent as well as a stabilizer. Carbon blacks are not effective in vinyl compounds since they do not show the same reinforcing properties that they do with most rubbers, according to the speaker.

In the molding of vinyl compositions, the speaker recommended that temperatures should not exceed 400° F. Higher temperatures will reduce molding time but are apt to cause degradation of the resin. It has been found that the use of a heated nozzle vastly improves the quality and finish of extruded articles, and prevents chilling of the injected resin, thereby eliminating strain.

Following the talks, a slate of candidates for office for the 1947-48 term was presented by the Nominating Committee and accepted by the committee. It was announced that plans are being formulated to conduct an essay contest for the membership. It was also announced that this year's outing will be held at Eichner's Grove in Trumbull, Conn., on Saturday, September 27.

VANCE, PALMER AND RITCHIE HEAD AKRON RUBBER GROUP

The election of officers for the 1947-48 season was the highlight of the annual Spring Meeting of the Akron Rubber Group, held at the Mayflower Hotel in Akron on May 9 and attended by approximately 320 members and guests. Roy M. Vance, of the General Tire & Rubber Co., was elected chairman, and H. F. Palmer, consulting rubber technologist and formerly of the Firestone Tire & Rubber Co., vice-chairman. C. A. Ritchie (Goodrich) was elected secretary-treasurer.

Frank H. Carman, general manager of the Plastics Materials Manufacturers Association, was the featured speaker of the evening. In his talk on "Plastics Materials," Mr. Carman emphasized the close relationship between the rubber and plastics industries, and the growing importance of plastics manufacture in many branches of the rubber industry.

The importance of design, scientific testing, and use of the proper plastic for the job are equally important in the rubber and plastics industries, the speaker stated. In this connection, he described the research project, sponsored by the P. M. M. A. and now in its second year, at the Massachusetts Institute of Technology. The project is directed toward a study of testing procedures to determine the fundamental properties of plastics and provide a means for the engineer to more properly design products through the use of engineering data.

Mr. Carman asserted that if new testing equipment and procedures are developed in this work, they will unquestionably be useful in the rubber industry.

A mobile laboratory designed to assist furniture manufacturers in the use of Airfoam is now touring the country for Goodyear.

FUHRMANN DISCUSSES RECLAIM AT MEETING OF DETROIT GROUP

Approximately 100 members and guests heard Alvin O. Fuhrmann, sales manager of the Midwest Rubber Reclaiming Co., East St. Louis, Ill., deliver a talk on "Post-War Reclaimed Rubber," at the Spring Meeting of the Detroit Rubber & Plastics Group, held at the Detroit Leland Hotel in Detroit, Mich., on May 16. A movie, entitled "The American Way," which illustrated the development of an American industry, using the construction and operation of a rubber reclaiming plant as a typical example, was also shown.

In his talk, Mr. Fuhrmann discussed the problems of the rubber reclaiming industry in producing reclaimed rubber during the war and post-war period which could compare favorably with pre-war reclaim. He said that during the war period rubber scrap contained approximately 12% natural rubber and 88% GR-S. In 1946 this ratio changed to 36% per cent natural rubber and 64% GR-S, with the percentage of natural rubber expected to be still higher this year.

Approximately 85% of reclaimed rubber manufactured today comes from tires, the speaker declared. Since there is no practical way to determine mixtures of natural rubber and GR-S in tires, present day reclaims, which are made from natural rubber and GR-S mixtures, are evaluated in compounded stocks by comparing them to pre-war reclaims.

By making checks from scrap piles, and coordinating results from factory processed reclaim with pre-war reclaim, a close check is maintained in producing a uniform product, Mr. Fuhrmann stated. Both chemical analysis of the reclaim and physical compounding tests in practical formulations show that these new natural rubber-GR-S reclaims are very similar to the pre-war straight natural rubber reclaims.

Stocks compounded with 100% natural reclaim were said to be less staining than similar stocks compounded from the blends. However, the blend has been found to give higher abrasion resistance in heel stocks. Mr. Fuhrmann concluded his talk by making comparisons of straight GR-S and GR-I reclaims with pre-war reclaims.

Southern Ohio Holds Outing

Approximately sixty members and guests attended the first outing of the Southern Ohio Rubber Group, held at the Inland Trapshooting Club, near Dayton, Ohio, on May 24. A prelude to the outing was a golf tournament in which sixteen members participated. No planned program of activities was followed at the outing, although a variety of equipment was on hand for sport and exercise, including softballs, volley balls, basketballs, and horseshoe pitching equipment.

CRUMPLER, DALE AND PETERSON HEAD CHICAGO RUBBER GROUP

William N. Crumpler, of the George S. Mepham Corp., and Robert C. Dale, of the Inland Rubber Corp., were elected chairman and vice-chairman, respectively, of the Chicago Rubber Group for the 1947-48 season at the Spring Meeting of the Group, held at the Hotel Morrison in Chicago, Ill., on May 9. W. H. Peterson (Enjay Co.) was elected secretary-treasurer of the Group.

In addition to the officers, various committee chairmen were named at the meeting, as follows: *Program,* Robert C. Dale (Inland Rubber); *Auditing,* S. L. Weller (DuPont); *Membership,* Jerome Harrison (Witco); *Publicity,* A. G. Susie (Marbon). E. T. Meyer (Herron & Meyer) was appointed historian of the Group.

The following were named members of the Executive Committee: Warren Bickel (Diamond Wire); Herman Boxser (Western Felt Works); Robert E. Elliott (Standard Oil—Indiana); G. W. Enke (Van Cleef); Paul F. Neisson (Victor Mfg.); George E. Popp (Phillips); John O. Prohaska (Roth Rubber); Herbert F. Schwarz (Sherwin-Williams); Dwight E. Smith (Inland Rubber); A. G. Susie (Marbon); J. Frank Taylor (Commercial Solvents); and J. P. Zak (Binney & Smith).

The featured speaker at the meeting was M. S. Moulton, technical service manager of Geon sales for the B. F. Goodrich Chemical Co., Cleveland, Ohio, who spoke on "Geon-Hycar Polyblends." The meeting also featured talks by John P. Carmichael, sports editor of the *Chicago Daily News,* and Harry E. Outcault, of the St. Joseph Lead Co., who is vice-chairman of the ACS Rubber Division. Mr. Carmichael gave an interesting account of his experiences as a sports writer, while Mr. Outcault spoke briefly on the activities of the Rubber Division and how the local rubber groups can best fit into the program of the parent society.

In his talk, Mr. Moulton described in detail the methods of compounding as well as the properties of the Geon-Hycar polyblend, which is a blend of Geon polyvinyl chloride and Hycar type butadiene-acrylonitrile synthetic rubber. It is unique in that it is a dispersion of solids of colloidal dimensions. With the polyblend it is possible to obtain outstanding properties which cannot be approached by either of the two components alone, the speaker stated.

The present Geon-Hycar polyblend was said to differ from earlier mill or Banbury mixtures of the two ingredients in that processing does not require the use of additional liquid plasticizer, although such may be added, if desired, to obtain a softer product. The material is characterized by extreme ease of processing and will form a smooth sheet immediately upon being placed on a hot or cold mill, according to Mr. Moulton. In general, the compounding is similar to that of Geon resins, with curing agents and antioxidants being employed if desired.

Some of the principal applications of the polyblends were reported to be based on the fact that the Hycar serves as a non-migratory, non-volatile plasticizer for the vinyl resin, while the vinyl component protects the Hycar from the effects of ozone and sunlight.

California Group Hears Brother

Dr. George H. Brother, head of the Western Regional Research Laboratory of the Industrial Products Division, U. S. Department of Agriculture at Albany, California, was the principal speaker at the April Meeting of the Northern California Rubber Group, held at Angelo's Restaurant in Emeryville, California, on April 24. In his talk on "Influence of High Polymer Technique in the Rubber Industry," Dr. Brother covered the chemical as well as the molecular aspects of the subject thoroughly.

New York to Hold Golf Tourney

A golf tournament has been scheduled to be held by the New York Rubber Group on Tuesday, August 5, at the Winged Foot Golf Club in Mamaroneck, N. Y. Departing from previous custom, the golf tourney this year has been separated from the annual outing, which will be held on June 27. Jean H. Nesbit, of the U. S. Rubber Reclaiming Co., 500 Fifth Ave., N. Y., is chairman of the Golf Committee.

Chicago to Hold Outing July 19

The annual summer outing of the Chicago Rubber Group is scheduled to be held on Saturday, July 19, at the Acacia Country Club near Chicago, Ill. A golf tournament will feature the outing. Dwight E. Smith, of the Inland Rubber Corp., 33 South Clark St., Chicago 3, Ill., is chairman of the Outing Committee.

PHILADELPHIA GROUP HEARS TALKS BY SMITH AND WILKES

Approximately 75 members and guests attended a meeting of the Philadelphia Rubber Group, held in Kugler's Restaurant in Philadelphia, Penna., on May 16. Dr. W. R. Smith and B. A. Wilkes, of Godfrey L. Cabot, Inc., were the principal speakers at the meeting. They spoke on "Recent Advances in Carbon Black Technology and Their Applications to the Rubber Industry." A feature of the dinner entertainment, which followed the meeting, was a community sing.

An abstract of the talks delivered by Dr. Smith and Mr. Wilkes follows herewith:

The furnace combustion process for producing carbon black accounted for about half the carbon black production in 1946. Economy, versatility of operation, variety of products and the fact that the furnace process can be economically operated with cheap fuel oils and other liquid hydrocarbons, assures this process of a prominent role in future carbon black production.

The fine furnace blacks now in production closely match EPC blacks in reinforcing ability and yet retain, to a considerable extent, the easier processing characteristics associated with furnace blacks.

Many of the earlier attempts at producing fully reinforcing furnace blacks resulted in enhancement of the high modulus, low elongation properties associated with HMF blacks. However, the fine furnace blacks presently in production do not display this undesirable characteristic. In fact, they are characterized by high elongation properties. These, together with exceptionally good processing characteristics, indicate the desirable combinations of properties which can be achieved in the furnace process.

Cement for Plastic Tile

A new rubber-plastic cement for adhering plastic tile to almost any surface, including concrete, brick, wood, or metal, has been introduced by the Adhesive Products Corp., 1660 Boone Ave., Bronx 60, N. Y. The cement is said to be easily applied by trowel to either floor or wall. After drying for fifteen minutes, a protective skin forms on the surface. This skin is scratched with a steel comb, after which the tile is placed on the cement and allowed to dry. The cement is reported to be self-vulcanizing and its tensile strength is said to continue to increase greatly for several days after application.

Goodrich Opens Alabama Unit

B. F. Goodrich Co. has announced the opening of its new $11,000,000 tire and tube manufacturing plant at Tuscaloosa, Ala. Completed late in 1946, the plant has a capacity production of 6,000 tires and tubes daily.

Tire Production in Mexico

Mexican tire manufacturers had one of the most active years in their history in 1946, according to the U. S. Bureau of Foreign and Domestic Commerce. Total production of passenger car and truck tires has been estimated at 465,000 units, with all factories working on a schedule of three shifts daily during most of the year. The industry progressed in capacity and efficiency to a level where one company produced almost double the quantity turned out in the preceding year, and other companies reported production and sales up about 10% from 1945. Total supplies, however, did not meet domestic demands, and no tires were exported. All companies anticipate a greater volume of business in 1947, and it is possible that production will reach 750,000 units. Raw materials are expected to be plentiful, and the industry is very hopeful that labor relations will continue good throughout the year. The purchase of additional equipment in limited quantities is anticipated, provided that the United States is able to supply it.

Unicel ND Blowing Agent

The availability of Unicel ND, a new blowing agent especially developed for the production of light-colored blown rubber sponge having a uniformly small cell structure, has been announced by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware. The new product is said to be an improvement over Unicel, originally developed for use in blown sponge, the dark color of which, plus its tendency to discolor light-colored sponge and to stain lacquered surfaces and fabrics in contact with sponge containing it, imposed limitations on its use. Unicel ND is said to possess the desirable properties of a sponge blowing agent but has eliminated most of these disadvantages. The active ingredient in Unicel ND is di-nitroso pentamethylene tetramine. Approximately 0.7 parts of Unicel ND will replace 1 part of Unicel.

Four Passenger Inflatable Boat

An all-purpose, four passenger inflatable boat, which is said to embody the same principles as the rubber life rafts used during World War II, has been introduced by the B. F. Goodrich Co., Akron. Designed to stand rough use, the boat is made of heavy cotton duck which is covered inside and out with an oil-resisting rubber compound. The boat weighs fifty pounds and has a flat bottom which is reported to make it almost impossible to upset. Other features claimed for the new craft by the company include aluminum oars which will float, a fast action military pump which will inflate the boat in a few minutes, provision for an outboard motor, two compartments, fore and aft, separated by bulkheads, and quick and easy assembly. It can be rolled up into a bundle hardly larger than the average suitcase.

Additions At Vanderbilt Co.

Within the past several months the R. T. Vanderbilt Co. which maintains headquarters in New York City and laboratories in East Norwalk, Conn., has added a number of new employees to its organization. Brief biographies of these new men follow herewith:

Sherman S. Rogers: B.S. in Chemistry from R.P.I., Troy, N. Y. Did some work in chemical engineering in the Graduate School at Oregon State College. Before joining Vanderbilt worked for Pequanoc Rubber, U. S. Rubber (Passaic), Johns-Manville (Manville), and General Cable (Bayonne). Served as officer in the Army during World War II. Mr. Rogers edits *Vanderbilt News.*

Roy L. Stoughton: B.S. in Chemical Engineering from University of New Hampshire. Worked with U. S. Rubber (Naugatuck, Cambridge and Mishawaka), DuPont (Fairfield), and Middletown Rubber. Was with United Aircraft Corp. during the war. Mr. Stoughton is in charge of the Proofing Laboratory at East Norwalk.

James C. Stewart: Chemical Engineer, Northeastern University, Boston, Mass. Has specialized in the coated fabrics industry and was associated with Clifton Manufacturing, Cotex Corporation, and Shelton Looms. Mr. Stewart is in charge of the Latex Laboratories at East Norwalk.

Thomas T. Noland: Graduate Chemist, Purdue University. Worker for three years in the research laboratories of the Socony Vacuum Oil Co., Paulsboro, N. J., and spent two years as an officer in the Navy. Mr. Noland will introduce Vanderbilt materials to the oil and chemical industries.

Charles H. Rogers: Chemistry Major at University of Virginia. Did graduate work in chemistry at Columbia University. Worked as a biochemist for 5 years with the American Cyanamid Co. and 4 years with the Continental Diamond Fiber Co. Mr. Rogers is in charge of the Biochemical Laboratory at East Norwalk.

Edgar J. Poh: B.S. in Chemistry and Biology, St. Johns College, and M.S. in Psychology and Education, St. Johns University, Graduate School. Worked for Sandoz Chemical Works, New York, taught science and mathematics in high school, and was with the Sperry Gyroscope Co. for three years. Mr. Poh is associated with the Biochemical Laboratory at East Norwalk.

Dr. Lester A. Brooks: B.S. in Chemical Engineering, M.I.T., and Ph.D. in Organic Chemistry, University of Illinois. Has been associated with Hooker Electrochemical Co., Sprague Electric Co., and Edcan Laboratories. Dr. Brooks is doing research work on various lines at East Norwalk.

Giles E. Hopkins: Chemical Engineering, M.I.T. Has spent the last 15 years in the textile industry, serving as director of the Textile Research Institute from 1943 to 1945. Has also acted as a consultant for the textile and allied industries.

Report on Polyurethanes

A special technical report on the reaction and field of application of the polyurethanes has been made available by the U. S. Department of Commerce. Originally presented as a paper in Germany in 1941 by Dr. Otto Bayer, of I. G. Farbenindustrie, the report has been translated into English by the National Bureau of Standards. Special mention is made in the report of the material as a bonding agent for Buna rubbers. According to the report, the addition of diisocyanates to Buna copolymers containing hydroxyl groups makes possible the attachment of Buna to almost any metallic surface. Tables on the properties of the Igamids, melting points of some of the polyurethanes, and properties of polyurethane molding compounds containing 50% wood flour are included. Copies of the report (PB 12635) may be obtained from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Planning Chemical Exposition

Announcement has been made that the 21st Exposition of Chemical Industries will be held at the Grand Central Palace in New York City during the first week in December. As heretofore, the display will combine chemicals and chemical products, with all manner of equipment employed in chemical manufacture and by the processing industries. A large proportion of previous exhibitors are reported to have already re-engaged spaces previously occupied and even at this early date it seems definite that four floors of the Palace will be fully occupied. The exposition, as heretofore, will be under the management of the International Exposition Co. Charles F. Roth is manager and E. K. Stevens associate manager.

Sunwax Microcrystalline Waxes

Sun Oil Co., Philadelphia 3, Penna., has announced the availability of two new, high quality microcrystalline waxes —Sunwax 1290 Brown and Sunwax 1290 Yellow. Developed for use wherever resiliency, high melting point, and high resistance to shock or shattering are required, the new petroleum waxes are finding application as plasticizers for rubber compounds. Both waxes have melting points of 175° to 185° F., and a penetration of 15 maximum (ASTM D-5-25). Technical literature is available from the company.

Wilmington Moves Sales Office

The Wilmington Chemical Corporation has announced the transfer of its main sales office from 10 East 40th St., New York, to 1 South Heald St., Wilmington, Delaware, effective May 30. This move, which will consolidate the sales office, plant and laboratory at one location, is anticipated to provide improved service to the company's customers.

NEW POLYMERS AUTHORIZED BY OFFICE OF RUBBER RESERVE, RECONSTRUCTION FINANCE CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Rubber Reserve, Reconstruction Finance Corporation since publication of those in our previous issue. Procedures for the distribution and sale of these polymers will be found in our October, 1945, issue. Normally, experimental polymers are produced only at the request of the consumers with 20 bales of the original run set aside for distribution to other interested companies for their evaluation. Such rubber is available in quantities of one or two bales upon request to the Sales Division of Rubber Reserve within six months after the experimental polymer was produced. Subsequent production runs are made if sufficient requests are received to warrant it.

X Number	*Manufacturing Plant*	*Date of Authorization*	*Polymer Description*	*Special Characteristics*
X-380 GR-S	Firestone, Port Neches	3/31/47	GR-S latex masterbatch containing 50 parts Silene EF per 100 parts GR-S-40 latex polymer (formerly X-245). Stabilized with 1.5 parts EFED and coagulated with zinc sulfate.	Non-staining type masterbatch of high styrene GR-S and a mineral pigment somewhat difficult to incorporate by mill or Banbury. Should be of interest for rolls, soles and heels, footwear, insulation, coated fabrics and mechanical goods.
X-385 GR-S	Goodyear, Houston	5/12/47	Regular GR-S type stabilized with 1½ parts R-2015. 46 to 54 Mooney.	Non-staining and non-discoloring type GR-S. May be useful for white sidewalls, refrigerator gaskets, footwear, heels and soles and other light colored mechanical goods.
X-386 GR-S-SP	U. S. Rubber, Naugatuck	5/7/47	GR-S-SP stabilized with 1½ parts UBUB. 46 to 54 Mooney.	Non-staining and non-discoloring type GR-S. Premium priced polymer may be useful for white sidewalls, refrigerator gaskets, footwear, heels and soles, wire insulation, and other light colored mechanical goods.
X-387 GR-S	Canadian Synthetic Rubber Corp., Sarnia, Ontario		Regular GR-S stabilized with BLE.	To be used as the standard GR-S reference samples beginning July 1, 1947.
X-388 GR-S Latex	U. S. Rubber, Naugatuck	5/8/47	50 isoprene-50 styrene latex with mixed rosin and synthetic emulsification.	May show advantages as tire cord dip and in blends with natural rubber.
X-389 GR-S	U. S. Rubber, Institute	5/23/47	Latex masterbatch containing 20 parts Philblack per 100 parts of a low Mooney GR-S polymer modified with a tertiary C-16 mercaptan, stabilized with UBUB and coagulated with salt-acid mixture. Mooney viscosity of unpigmented polymer will be 15 to 25.	Pigment added to allow handling of very low Mooney polymer. X-389, formerly identified as XP-75, is a non-staining type masterbatch especially made for chemically blown sponge since it requires no breakdown before compounding May improve thermal flow for use in footwear.
X-391 GR-S	Canadian Synthetic Rubber Corp., Sarnia Ontario		GR-S-20 AC stabilized with 1.25 parts Stalite; Mooney viscosity, 41-49 Alum coagulation.	
X-392 GR-S-SP	U. S. Rubber, Naugatuck	5/21/47	Regular GR-S-65-SP except stabilized with 1.5 parts of UBUB (added as soluble salt, UGUL). Coagulated with glue-acid.	Low-water-absorption non-staining type polymer. Developed for wire and cable insulation. Should be satisfactory for refrigerator gaskets and other mechanical goods applications requiring these characteristics. Premium priced polymer. Improved X-362.
X-393 GR-S-SP	U. S. Rubber, Naugatuck	5/29/47	Regular GR-S-60-SP except stabilized with 1.5 parts UBUB (added as soluble salt, UGUL). Coagulated with glue-acid.	Superior processing GR-S-60 (X-285) type polymer having low-water-soluble material and non-staining characteristics. Designed for use in blends with other non-staining GR-S polymers. Developed for wire and cable insulation as improved X-363.
X-394 GR-S	Goodyear, Torrance	5/29/47	Regular GR-S made to 41-49 Mooney viscosity, stabilized with BLE. Salt-acid coagulation.	Similar to GR-S-20 AC except that salt-acid coagulation is used in place of alum.

The Stewart Tire and Fire Aid, a small, handy steel cylinder containing 10 ounces of CO_2, specifically designed for inflating tires and as a fire extinguisher, was recently introduced by the Stewart Manufacturing Co., Indianapolis 1, Indiana.

Thiokol Corporation, Trenton, N. J., has made available a new technical bulletin treating with the compounding of Buna N rubbers with Thiokol FA. Several typical compounds are shown. Ask for Technical Service Bulletin No. 101.

Buffalo Weaving & Belting Co., Buffalo, N. Y., has announced that its plastic-coated conveyor belting, sold under the name of Plastex, is now available in widths up to 72 inches. The greatest width previously available was 48 inches.

Tire Production in Mexico

Mexican tire manufacturers had one of the most active years in their history in 1946, according to the U. S. Bureau of Foreign and Domestic Commerce. Total production of passenger car and truck tires has been estimated at 465,000 units, with all factories working on a schedule of three shifts daily during most of the year. The industry progressed in capacity and efficiency to a level where one company produced almost double the quantity turned out in the preceding year, and other companies reported production and sales up about 10% from 1945. Total supplies, however, did not meet domestic demands, and no tires were exported. All companies anticipate a greater volume of business in 1947, and it is possible that production will reach 750,000 units. Raw materials are expected to be plentiful, and the industry is very hopeful that labor relations will continue good throughout the year. The purchase of additional equipment in limited quantities is anticipated, provided that the United States is able to supply it.

Unicel ND Blowing Agent

The availability of Unicel ND, a new blowing agent especially developed for the production of light-colored blown rubber sponge having a uniformly small cell structure, has been announced by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware. The new product is said to be an improvement over Unicel, originally developed for use in blown sponge, the dark color of which, plus its tendency to discolor light-colored sponge and to stain lacquered surfaces and fabrics in contact with sponge containing it, imposed limitations on its use. Unicel ND is said to possess the desirable properties of a sponge blowing agent but has eliminated most of these disadvantages. The active ingredient in Unicel ND is di-nitroso pentamethylene tetramine. Approximately 0.7 parts of Unicel ND will replace 1 part of Unicel.

Four Passenger Inflatable Boat

An all-purpose, four passenger inflatable boat, which is said to embody the same principles as the rubber life rafts used during World War II, has been introduced by the B. F. Goodrich Co., Akron. Designed to stand rough use, the boat is made of heavy cotton duck which is covered inside and out with an oil-resisting rubber compound. The boat weighs fifty pounds and has a flat bottom which is reported to make it almost impossible to upset. Other features claimed for the new craft by the company include aluminum oars which will float, a fast action military pump which will inflate the boat in a few minutes, provision for an outboard motor, two compartments, fore and aft, separated by bulkheads, and quick and easy assembly. It can be rolled up into a bundle hardly larger than the average suitcase.

Additions At Vanderbilt Co.

Within the past several months the R. T. Vanderbilt Co. which maintains headquarters in New York City and laboratories in East Norwalk, Conn., has added a number of new employees to its organization. Brief biographies of these new men follow herewith:

Sherman S. Rogers: B.S. in Chemistry from R.P.I., Troy, N. Y. Did some work in chemical engineering in the Graduate School at Oregon State College. Before joining Vanderbilt worked for Pequanoc Rubber, U. S. Rubber (Passaic), Johns-Manville (Manville), and General Cable (Bayonne). Served as officer in the Army during World War II. Mr. Rogers edits *Vanderbilt News.*

Roy L. Stoughton: B.S. in Chemical Engineering from University of New Hampshire. Worked with U. S. Rubber (Naugatuck, Cambridge and Mishawaka), DuPont (Fairfield), and Middletown Rubber. Was with United Aircraft Corp. during the war. Mr. Stoughton is in charge of the Proofing Laboratory at East Norwalk.

James C. Stewart: Chemical Engineer, Northeastern University, Boston, Mass. Has specialized in the coated fabrics industry and was associated with Clifton Manufacturing, Cotex Corporation, and Shelton Looms. Mr. Stewart is in charge of the Latex Laboratories at East Norwalk.

Thomas T. Noland: Graduate Chemist, Purdue University. Worker for three years in the research laboratories of the Socony Vacuum Oil Co., Paulsboro, N. J., and spent two years as an officer in the Navy. Mr. Noland will introduce Vanderbilt materials to the oil and chemical industries.

Charles H. Rogers: Chemistry Major at University of Virginia. Did graduate work in chemistry at Columbia University. Worked as a biochemist for 5 years with the American Cyanamid Co. and 4 years with the Continental Diamond Fiber Co. Mr. Rogers is in charge of the Biochemical Laboratory at East Norwalk.

Edgar J. Poh: B.S. in Chemistry and Biology, St. Johns College, and M.S. in Psychology and Education, St. Johns University, Graduate School. Worked for Sandoz Chemical Works, New York, taught science and mathematics in high school, and was with the Sperry Gyroscope Co. for three years. Mr. Poh is associated with the Biochemical Laboratory at East Norwalk.

Dr. Lester A. Brooks: B.S. in Chemical Engineering, M.I.T., and Ph.D. in Organic Chemistry, University of Illinois. Has been associated with Hooker Electrochemical Co., Sprague Electric Co., and Edcan Laboratories. Dr. Brooks is doing research work on various lines at East Norwalk.

Giles E. Hopkins: Chemical Engineering, M.I.T. Has spent the last 15 years in the textile industry, serving as director of the Textile Research Institute from 1943 to 1945. Has also acted as a consultant for the textile and allied industries.

Report on Polyurethanes

A special technical report on the reaction and field of application of the polyurethanes has been made available by the U. S. Department of Commerce. Originally presented as a paper in Germany in 1941 by Dr. Otto Bayer, of I. G. Farbenindustrie, the report has been translated into English by the National Bureau of Standards. Special mention is made in the report of the material as a bonding agent for Buna rubbers. According to the report, the addition of diisocyanates to Buna copolymers containing hydroxyl groups makes possible the attachment of Buna to almost any metallic surface. Tables on the properties of the Igamids, melting points of some of the polyurethanes, and properties of polyurethane molding compounds containing 50% wood flour are included. Copies of the report (PB 12635) may be obtained from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Planning Chemical Exposition

Announcement has been made that the 21st Exposition of Chemical Industries will be held at the Grand Central Palace in New York City during the first week in December. As heretofore, the display will combine chemicals and chemical products, with all manner of equipment employed in chemical manufacture and by the processing industries. A large proportion of previous exhibitors are reported to have already re-engaged spaces previously occupied and even at this early date it seems definite that four floors of the Palace will be fully occupied. The exposition, as heretofore, will be under the management of the International Exposition Co. Charles F. Roth is manager and E. K. Stevens associate manager.

Sunwax Microcrystalline Waxes

Sun Oil Co., Philadelphia 3, Penna., has announced the availability of two new, high quality microcrystalline waxes —Sunwax 1290 Brown and Sunwax 1290 Yellow. Developed for use wherever resiliency, high melting point, and high resistance to shock or shattering are required, the new petroleum waxes are finding application as plasticizers for rubber compounds. Both waxes have melting points of 175° to 185° F., and a penetration of 15 maximum (ASTM D-5-25). Technical literature is available from the company.

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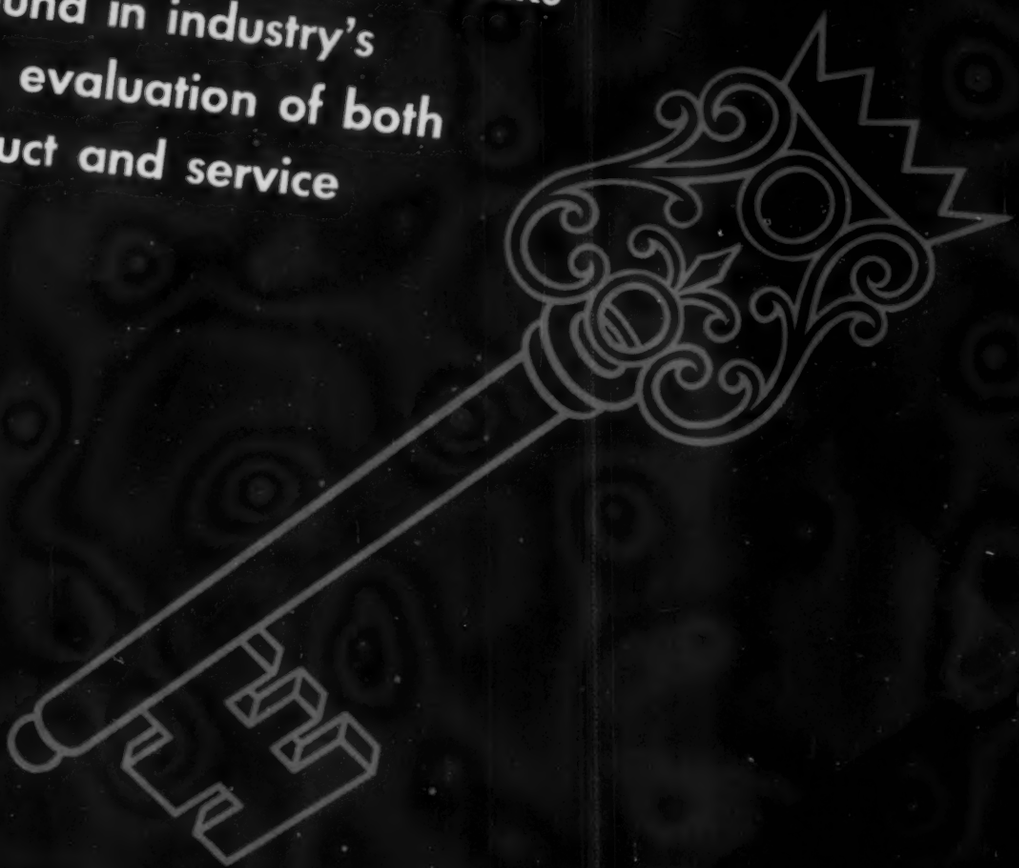
...in the field of carbon blacks
is found in industry's
own evaluation of both
product and service



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Settle Phillips Gas Strike

A twenty-day strike at the Borger, Texas, gas plant of the Phillips Petroleum Co. was settled on May 21. The plant supplies approximately 30% of the natural gas used for the production of channel black, and several of the carbon black plants in the vicinity were forced to curtail or shut down during the period of the strike. Production at plants operated by the United Carbon Co. and the Columbian Carbon Co. was most seriously disrupted by the strike, but these plants are rapidly nearing full production again. The Borger area accounts for approximately 75% of channel black production. Approval of a bill to permit the use of Panhandle sweet gas to manufacture carbon black was given by the Texas Legislature on May 19. The bill provides that sweet gas can be used for making carbon black if the yield is one and one-half pounds per 1,000 feet of gas and the producer receives a price equal to that paid in the area for gas sold for light and fuel uses. On June 10, Governor Beauford Jester signed the bill.

Jefco Baling Cloth

Jefco Jute Tubing, described as a revolutionary new kind of baling cloth specifically designed to cut labor costs and save baling time, has been introduced by the J. E. Fricke Co., 38 North Front St., Philadelphia 6, Penna. The new cloth is a seamless, continuous, tubular burlap that differs from ordinary covering materials in its ability to conform quickly and easily to packages of almost any size and shape, assuring smooth, snug-fitting protection. The versatility of the material is accounted for by its "two-way stretch." Because of this stretchable feature, Jefco tubing 10 inches wide can be used to cover packages or bales with diameters ranging from 8 to 11 inches or circumferences from 22 to 38 inches. This eliminates the need for buying and stocking as many different widths of coverings. Jefco tubing comes in convenient, easily mounted rolls.

Geon Resin 100-X-26

B. F. Goodrich Chemical Co., Cleveland, Ohio, has introduced a new polyvinyl chloride paste forming resin which can be used for coatings on paper and fabrics, as thin films for curtains and raincoats, and thicker sheeting for upholstery, handbags, and shoes. Known as Geon Resin 100-X-26, the material is said to be the first of its type made in the United States. A free flowing white powder with a specific gravity of 1.40, the plastic is reported to be easily dispersed in plasticizer with the use of simple processing equipment. There are two methods for formulating this new resin. One is by use of a resin and plasticizer mixture, where the resin is merely dispersed in a plasticizer by simple stirring. The other is the addition of a volatile diluent to the resin-plasticizer mixture.

Establishes West Coast Branch

D. C. Maddy

Harwick Standard Chemical Co. has announced the establishment of a West Coast warehouse and branch office at 1248 Wholesale St., Los Angeles, Calif. D. C. Maddy, who has been associated with the B. F. Goodrich Co. in the West Coast area for the past several years in connection with the sale of Hycar synthetic rubbers, has been named manager of the new branch. Shortly after graduating from the University of Illinois with a B.S. degree in chemical engineering in 1927, Mr. Maddy joined the Goodrich organization, serving in various capacities in the company's general chemical laboratory, chemical plant laboratory, tire and processing divisions, and rubber preparation department before being transferred to the Goodrich plant on the West Coast.

Forms Vinyl Sales Department

The formation of a new vinyl resin sales department has been announced by the plastics division of the Monsanto Chemical Co., with Stanley L. King as sales manager. Assisting Mr. King will be David S. Plumb, in charge of wire extrusion and fabric coating compounds, and Ralph F. Hansen, in charge of elastomeric film materials. The new department will handle vinyl chloride resins and compounds, vinyl butyral resins and compounds, and safety glass material Headquarters are at Springfield, Mass.

Camelback Production in 1946

Production of camelback has increased approximately three-and-a-half times over prewar volume, according to the Rubber Manufacturers Association. Increases were attributed to "war-learned lessons" in the economy of recapping as an extender of tire life. Output of 171,000,000 pounds of camelback in 1946 compared with 49,000,000 pounds in 1940.

Goodyear Penalized by OMD

The Office of Materials Distribution of the Department of Commerce, which recently took over the functions of the former CPA Rubber Division, on June 5th ordered the Goodyear Tire & Rubber Co. to cut back its use of natural rubber latex by 500,000 pounds over the next five months. According to H. B. McCoy, OMD director, Goodyear officials admitted the company had violated Rubber Order R-1 by diverting a net total of more than 500,000 pounds of natural rubber latex from the manufacture of products for which its consumption had been authorized. He added that the company also admitted that although it had specified certain quantities of the latex would be used for tire cord dip none actually was so used, but instead "it was used in the manufacture of unauthorized foamed latex products." The cutback was one of the largest penalties invoked for violation of the rubber order.

S. A. E. Hears Rittenhouse

H. L. Rittenhouse, chief engineer of the Euclid Road Machinery Co., Cleveland, Ohio, delivered a talk on "Rubber-Tired Hauling Equipment for Off-the-Highway Service" at the Summer Meeting of the Society of Automotive Engineers, held at the French Lick Springs Hotel, French Lick, Ind., from June 1 to 6. In his talk, Mr. Rittenhouse declared that no other single item has contributed so much to the evolution of earth moving equipment as the pneumatic tire. Various types of these giant tires are being used, some being designed for earth moving and others to resist cutting when used in rock or rough excavations. The speaker said that tires are now being produced for the construction field in 21, 24, 27, 30, and 36 inch widths. He pointed out that in the last few years heavier and more substantial rims, such as the tapered bead seat rim, have been developed for these larger tires.

Tire Production in March

Production of passenger car tires by American manufacturers in March amounted to 6,973,234 units, an increase of 8.5% over the 6,429,156 units produced during the previous month, according to the Rubber Manufacturers Association. Truck and bus tire production was 1,603,883 units for the month, an increase of 7.9% over February, while production of passenger car, truck and bus tubes increased 1%, from 7,841,251 units in February to 7,920,552 in March. The report indicated that 25,000,493 automotive tires were produced during the first quarter of 1946, with 20,290,956 of them in passenger car sizes. The first quarter output of passenger car tires was at the annual rate of slightly over 81,000,000 units, as compared with a record of over 66,000,000 units in 1946 and with 50,965,000 units in 1940, the previous peak year.

MINUTES OF RUBBER CONSULTING TECHNICAL COMMITTEE MEETINGS

We continue herewith our policy of publishing the minutes, either in full or part, of meetings of various consulting technical committees with government officials. Two things must be remembered in connection with these minutes: (1) They cover that portion of the meetings attended by representatives of the Office of Rubber Reserve; (2) By nature of their purpose the meetings do not reflect the favorable side of synthetic rubber.

Meeting of the Mechanical Goods Consulting Technical Committee. Held: October 10, 1946. Government Presiding Officers: A. R. Miller (OTC-CPA) and J. N. Street (ORR). Chairman: W. L. Smith (Goodrich).

(EDITOR'S NOTE: Since the Technical Service Section of the Research and Development Division of the Office of Rubber Reserve had not been established at the time of this meeting, these minutes are based primarily upon internal memoranda and notes of personnel of Rubber Reserve and CPA members present at the meeting. The minutes were recently prepared because of the importance of the mechanical goods group. The developments of other consulting technical committees are incorporated in these minutes).

The meeting was opened with a statement from the Chairman that certain difficulties were encountered in the use of GR-S for mechanical goods. The general discussion below includes Rubber Reserve's comments and a brief resume of the Rubber Reserve polymer development program. The major difficulties experienced currently by the mechanical goods segment of industry are as follows:

1. Variability in tubing characteristics.
2. Poor physical properties of non-black loaded stocks.
3. Low pure gum tensile.
4. Staining and discoloration.
5. Variability in processing.
6. Low hot tear resistance.
7. Improved resilience and tack desired.
8. Blooming of cured and uncured vulcanizates.

Variability in Tubing Characteristics

The rate-of-extrusion and swell-at-the-die were both included in this category. Variability between the many numbered GR-S types and experimental polymers would be expected. However, to even out the variability in these characteristics in any one GR-S type, blends with GR-S-60 (formerly X-285) or its non-staining variation X-344 should be helpful. X-371 is now scheduled for production as a relatively non-staining GR-S-60 since it is stabilized with Stalite. Other similar cross-linked (high gel) polymers are being prepared at the Government Laboratories, Akron, Ohio, as follows:

(a) XP-60: A non-staining, mixed rosin acid and fatty acid soap emulsified GR-S, otherwise similar to X-344. Improved adhesion to fabrics is anticipated when compared to GR-S-60 and X-344.

(b) XP-64: A cross-linked isoprene-styrene-divinylbenzene polymer having rosin acid soap emulsification, alum coagulation and a 65 ± 8 Mooney (analogous to GR-S-60 except that isoprene replaces butadiene); expected to be a superior processing isoprene polymer which should be of exceptional interest in blends with natural rubber. This combination should form a one phase system with natural rubber since both have similar aging characteristics. It may also show improved tack along with superior processing in blends with non-reverting GR-S polymers.

(c) XP-74: A 100 Mooney modification of XP-64. This should give higher tensile strength in high gum and mineral pigment compounds.

The Committee stated that the Mooney plastometer was not a satisfactory test method for evaluating a polymer for tubing characteristics. No satisfactory method was apparently known to any of the Committee present. The nearest approach suggested was the mill banding test. Laboratory tubing machines are good for thin-walled goods, but not necessarily indicative in case of heavy gages. The Garvey die has proven useful in the laboratory tubing technique.

Non-Black Loaded Stocks

At the present time, poor physical properties seen inherent in GR-S type polymers particularly, when judged by tensile strength, tear resistance and rebound. Slightly improved results may be obtained by compounding with higher Mooney polymers such as GR-S-16 (formerly X-272), a 100 Mooney non-staining (Stalite) GR-S-10 type having low water solubles, and X-274 a 60 Mooney, non-staining (Stalite) GR-S-10. The physical properties of GR-S-10 in non-black stocks were reported to be generally better than other GR-S polymers. GR-S-16 could be of particular value either alone or in blends with GR-S-50 or X-274. The higher Mooney GR-S-10 types have a reduced tendency to stick to mill rolls in many compounds when compared to GR-S-10.

The main prospect for improvement in the physical properties of GR-S is through better dispersion of pigments. Latex masterbatches of mineral pigments have been reported to result in better modulus, tensile and elongation, rebound, and slightly better tear resistance, when compared to mill mixing. The hardness remains about the same. Extrusion rates are faster and processing as measured by tubing index is improved, although swell at the die is slightly greater.

X-380 containing 50 parts of Silene EF per 100 parts GR-S-40AC and X-315 containing 50 parts Silene EF per 100 parts GR-S-25 are now, or will soon be, available for evaluation. These masterbatch types are particularly desirable for pigments (Kalvan, hard clays, Silene, etc.) which are difficult to incorporate in mill or Banbury mixing. If other type pigments are desired, an expression of that opinion should be forwarded to the Research and Development Division of the Office of Rubber Reserve, either through the Committee Chairman or directly.

Recent carbon black experimental masterbatches in which this Committee might be interested include:

X-335: 25 parts Philblack per 100 parts GR-S-10 type polymer with polymer Mooney at 35 ± 5 and having a mixed rosin and fatty acid soap emulsification and PBNA stabilizer.

X-334: Same as X-335 except that it contains 40 parts Furnex in masterbatch.

X-347: GR-S-Black-1 with 30 ± 5 polymer Mooney.

GR-S-Black-2 (formerly X-348): Same at GR-S Black-1 except that it contains 46 parts EPC black instead of 50 parts.

X-357: 55 parts SRF black per 100 parts GR-S-10 stabilized with 1.5 parts BLE (55 ± 5 polymer Mooney).

X-369: 55 parts HMF black per 100 parts GR-S stabilized with 1.5 parts BLE (38 ± 5 polymer Mooney).

X-374: 80 parts Gastex per 100 parts GR-S stabilized with 1.5 parts BLE (38 ± 5 polymer Mooney).

X-376: GR-S-Black-1 with polymer Mooney at 50 ± 5.

X-377: GR-S-Black-1 with polymer Mooney at 70 ± 5.

X-378: 55 parts SRF black per 100 parts GR-S-10 stabilized with UGUL (non-staining type).

Evaluation samples of the above masterbatches in quantities up to 75 pounds may be available upon application to the Sales Division for purchase permits. It should be noted, however, in view of limited production facilities and carbon black availability that large quantities of these masterbatches may not be available in the near future. Evaluation of these black masterbatches would be desirable at this time so that reports would be available to guide Rubber Reserve as to the desires of the industry when and if production facilities become available.

Normally, experimental polymers are produced only at the request of the consumers with twenty bales of the original run set aside for distribution to other interested companies for their evaluation. Such rubber is available in quantities of one or two bales upon request to the Sales Division within six months after the experimental polymer was produced. Subsequent production runs are made if sufficient requests are received to warrant it.

Low Pure Gum Tensile

Little improvement in this characteristic can be expected. This remains a research problem. This is a fundamental problem in GR-S and will necessitate exploration and development work on other monomer polymers which may require considerable time.

Staining and Discoloration

Staining is described as the discoloration of materials or surfaces such as lacquer, enamel, etc., adjacent to and in con-

tact with a rubber product; discoloration as the change in color of light colored rubber products usually caused by their exposure to light or heat. Reports on existing non-staining GR-S types indicated that several improvements were desired. GR-S-25, which is stabilized with EFED, has excellent non-staining properties, but has an odor which is somewhat disagreeable to factory workmen handling it. GR-S-50 has very good aging properties, resulting from the use of Stalite as a stabilizer, and while it has much better non-staining characteristics than standard antioxidants, it is not so good as GR-S-25 in this property.

A pilot plant experimental non-staining type GR-S, stabilized with antioxidant R-2015, is reported to have improved heat aging characteristics compared to GR-S-25 and better non-staining properties than GR-S-50. This polymer is available for sampling to the industry as GR-S-PB-70202A9A and may be obtained in 10-pound lots upon application to the Chemical Products Division, Goodyear Tire and Rubber Company, Akron, Ohio. No permit requests will be required, although a report on evaluation tests shall be made to Rubber Reserve as on all other experimental polymers.

A non-staining standard GR-S type pilot plant polymer has been scheduled by the United States Rubber Company as R-308, which will be similar to GR-S-25 but stabilized with IBUL (or equivalent salt). A 10-pound sample of R-308 may be obtained by application to the Synthetic Rubber Division, U. S. Rubber Company, Naugatuck, Connecticut.

A non-staining variation of GR-S-65, having similar low-water absorption and a slightly faster rate of cure, has been prepared by Naugatuck as X-362.

A non-staining, low-water-absorption GR-S-60 type for use in improving the processing characteristics (milling, calendering and tubing) in blends with other non-staining GR-S types or natural rubber has been scheduled with Naugatuck finishing process as X-363. (Referred to in meeting as J-454).

A preliminary report on X-363 indicates a higher Mooney than this objective and Williams' plasticity and recovery which corresponds to other similar polymers. The compounded Mooney on X-363 was similar to that obtained on other cross-linked polymers. In the case of cross-linked polymers, the effect of Mooney is masked as far as processing differences are concerned. X-363 is also a low-water-absorption variation of X-344.

It should be noted that dry polymers stabilized with UBUF will contain the same antioxidant as those stabilized with IBUL since the UBUF is reconverted to IBUL in the process. UBUF is being used in place of IBUL in several cases because of greater ease in handling.

The total production of X-362 and X-363 has been covered by permits previously issued. However, 5-pound samples may be obtained upon application to Rubber Reserve.

Improved processing characteristics with the same or better non-staining properties might be obtained immediately using available experimental and special purpose GR-S polymers by the following blends (rather than await the continued development of pilot plant experimentals described above):

GR-S-17 (formerly X-273) and X-344.
GR-S-50 and X-344.
GR-S-25 and X-344.
GR-S-50 and GR-S-25 or GR-S-17.

It has previously been reported that the staining properties of a rubber compound decreased exponentially with a linear reduction in antioxidant. This would suggest that improved properties could be obtained by blending GR-S-50 with GR-S-25 or GR-S-17, which combinations would have superior resistance to staining than that produced with GR-S-50 and better aging properties than exhibited by GR-S-25 or GR-S-17. GR-S-17 would also increase the tackiness of the stocks since it is a GR-S-10 type (stabilized with EFED). X-344 in blends with GR-S-50 should improve processing, staining characteristics, and heat aging, as well as increasing the rate of cure.

The properties of blends of GR-S and natural rubber could be improved in many cases by compounding each rubber separately to give equivalent plasticities and rates of cure and then blending them before the final processing step. 50-50 blends of natural rubber and GR-S-50 have been reported to be considerably better than all rubber compounds in aging and non-staining properties as determined in a fadeometer and in evening out the large variability in rate of cure of the natural rubber now obtainable. Non-reverting natural rubber stocks may be compounded by using approximately 25 parts GR-S to 75 parts rubber with proper acceleration.

The Committee indicated that some staining was occurring in the pale crepe now obtainable. This is further aggravated by the very limited amount of pale crepe available in this country.

Variability in Processing

GR-S polymers in general are credited with a much greater degree of uniformity than natural rubber. Processing and rate of cure, particularly, are included under this designation. Rubber Reserve is continuing to strive toward improved uniformity of all factors contributing to improved GR-S. In some cases, non-uniformity in processing may be attributed to variability in factory handling from day to day or even hour to hour.

Alum-coagulated GR-S polymers (raw) in general do not oxidize as rapidly as standard GR-S (this does not necessarily apply to vulcanizates) and as a result undergo a smaller change in viscosity during mastication. Some users find that under variable breakdown conditions, the use of these alum types results in compounds having more uniform viscosity and therefore consider them to have superior processing characteristics. GR-S-AC, GR-S-10AC (formerly X-222) and X-317AC (non-staining type) are among the AC types which might be of interest from this standpoint.

Low Hot Tear Resistance

Improved molding characteristics are obtained by blending small quantities (5 to 30%) of cross-linked GR-S polymers like GR-S-60, and X-344 with other GR-S types or natural rubber. While these polymers do not increase the hot tear resistance, improvement in molding characteristics may counterbalance the low hot tear properties. Higher styrene copolymers also exhibit higher tear resistance than standard GR-S, although their low temperature (freeze) properties are poorer. These types include GR-S-40AC and X-278, both of which are 50 butadiene and 50 styrene copolymers. Copolymers of butadiene and chlorostyrene have shown increased flex life in tire tests and improved tear resistance. Two types are suggested for investigation, XP-36C and XP-39, described as follows:

XP-36C: 71 butadiene-29 monochlorostyrene, fatty acid soap emulsification, salt acid coagulation, 62 Mooney, PBNA stabilizer.

XP-39: 71 butadiene-29 dichlorostyrene, fatty acid soap emulsification, salt acid coagulation, 63 Mooney, PBNA stabilizer.

The chlorostyrene polymers are not recommended for low temperature applications, but may be of considerable interest for other specific applications.

Improved Resilience and Tack

Major improvements in resilience and tack are still research problems. The isoprene polymers offer the greatest improvements among presently available GR-S.

Isoprene polymers tend to undergo the same type of chemical reactions as natural rubber and have thus the same tendency towards reversion and heat softening after vulcanization which should eliminate the possibility of a two-phase system. X-141, a 75 isoprene-25 styrene rosin acid emulsified polymer, has been reported to have lower hysteresis and thus lower heat generation, improved tack, higher resilience, faster cure rate, and better tear resistance than standard GR-S. Blends of GR-S and natural rubber have been considered by some to form a two-phase system in the final product.

This tendency, if true, might be greatly reduced or eliminated by investigating blends of the isoprene polymers, X-141 and X-281 (polyisoprene) with natural rubber. Rubber Reserve now has under development in the pilot plant stage four additional isoprene polymers, XP-64, XP-65, XP-66, and XP-74, which may be described briefly as:

XP-64: 75 isoprene-24.5 styrene-0.5 divinylbenzene, rosin soap emulsification, alum coagulation, 65 ± 8 Mooney, PBNA stabilizer (X-141 type with cross-linking agent to obtain better processing, except that isoprene replaces butadiene, analogous to GR-S-60 (formerly X-285).

XP-65: Control for XP-64. Same

description except divinyl-benzene is omitted.

XP-66: 90 isoprene-10 dichlorostyrene, rosin soap emulsification, salt acid coagulation, 55 to 65 Mooney, PBNA stabilizer.

XP-74: 100 Mooney modification of XP-64.

Blooming of Vulcanizates

Two instances were reported of serious blooming of GR-S compounds. It was understood that samples of GR-S in this condition will be sent in to the Research and Development Division, Office of Rubber Reserve, if it occurs again. Attempts will then be made to determine the cause.

General Discussion

The Office of Rubber Reserve in cooperation with various OTC-CPA Consulting Technical Committees has under schedule the production of a number of experimental pilot plant (XP) polymers at the Government Laboratories, Akron, Ohio. These polymers are designed for specific purposes and groups. However, in view of the diversified interests of the Mechanical Goods Committe, these XP polymers are listed as a matter of information: XP-59, XP-60, XP-61, XP62 (supersedes XP-59), XP-63, XP-64, XP-65, XP-66, XP-73, XP-74, XP-75 and XP-76. A brief description of these XP polymers follows:

XP-59: A non-staining, 15 to 20 Mooney GR-S, tertiary C-16 mercaptan polymer with 1.5 parts EFED and shortstopped with hydroquinone. XP-59 is superseded by XP-62 because of staining attributed to hydroquinone. This polymer was designed to eliminate the breakdown now required when X-317 GR-S or GR-S-40AC are used for chemically blown sponge.

XP-60: A 72 butadiene-27.5 styrene-0.5 divinylbenzene GR-S, having a mixed fatty acid and rosin acid soap emulsification, 58 ± 8 Mooney, non-staining type shortstop, 1.5 UBUF and salt acid coagulation. This polymer is designed to have non-staining and superior processing characteristics and improved adhesion to fabrics when compared to X-344.

XP-61: A non-staining variation of GR-S-85 prepared in the same manner as XP-60 except for a hundred Mooney and the omission of divinylbenzene; prepared especially for use in spreading doughs.

XP-62: A non-staining, (low Mooney 15 to 20), tertiary C-16 mercaptan modified GR-S, stabilized with 1.75 parts of UBUF and salt acid coagulation. XP-62 supersedes XP-59 which contained hydroquinone (causing undesirable staining).

XP-63: This is polybutadiene made according to the regular GR-S formula (50 Mooney objective); this polymer prepared particularly for evaluation for hard rubber products.

XP-64: 75 isoprene-24.5 styrene-0.5 divinylbenzene, rosin soap emulsification, alum coagulation, 65 ± 8 Mooney, PBNA stabilizer (X-141 type with cross-linking agent to obtain better processing) except that isoprene replaces butadiene—analogous to GR-S-60 (formerly X-285).

XP-65: Same as XP-64 except 75 isoprene-25 styrene charging ratio and 65 + or — 5 Mooney.

XP-66: 90 isoprene-10 dichlorostyrene, rosin soap emulsification, salt acid coagulation, 55 to 65 Mooney, PBNA stabilizer.

XP-73: A Silene latex materbatch of 50 parts Silene EF per hundred parts of a polymer having a charge ratio of 72 butadiene-27.5 styrene-0.5 divinylbenzene, 58 plus or minus 8 Mooney, a non-staining shortstop and 1.75 parts UBUF stabilizer, with other conditions same as GR-S-10 (rosin soap emulsification and calcium chloride coagulation).

XP-74: 100 Mooney plus or minus 10 variation of XP-64. Expected to have higher green strength. (Isoprene polymers generally have higher Mooney than butadiene polymers.)

XP-75: A latex masterbatch of 20 parts Philblack in XP-62 latex stabilized with 1.5 parts Stalite (being prepared for evaluation for chemically blown sponge in case XP-62 cannot be handled and dried in production equipment).

XP-76: A latex masterbatch of 25 parts Silene EF in XP-62 latex stabilized with 1.75 parts UBUF. Same purpose as XP-75.

Five-pound samples of any of these XP-polymers, if still available, will be forwarded for evaluation upon request to the undersigned, with the understanding that a report of the results of tests will be made to the Research and Development Division of the Office of Rubber Reserve. Any improvements which are suggested may be helpful. To be of greatest value, this report should treat specific properties rather than a general indication that a polymer is relatively better or worse than GR-S. This information will be used in determining whether further improvements can be made in our efforts to develop superior types of synthetic rubber.

Lower water-absorption rubber generally produces compounds having superior electrical properties. Extremely low water-absorption polymers may be required for other specialty applications. It is worth noting that very low water-absorption GR-S may be obtained at no price differential from the standard types; whereas, a premium price has been established on natural rubber types (deproteinized) having very low water soluble materials.

X-361 has recently been developed as a standard GR-S type coagulated by a special alum process designed to keep water soluble material to a minimum, and is being sampled to the industry, having extremely low water absorption characteristics comparable to deproteinized or washed natural rubber. Requests for samples of X-361 (at the present time) should be directed to the Chemical Products Division, Goodyear Tire and Rubber Company, Akron, Ohio.

R. E. HARMON

Goodrich Develops Tubeless Tire

B. F. Goodrich Co., Akron, has announced the development of a tubeless tire, which is at present undergoing various road tests. Perfected after more than three years of engineering, the new tire is said to combine the safety features of puncture sealing inner tubes with improved riding qualities, high bruise resistance, and remarkable ability to retain air pressure. The tubeless tire embodies rayon cord construction. In addition to undergoing a high-speed road testing program in the Southwest, the tubeless tire is in service on a taxicab fleet in a midwestern city, on state police cars and a number of privately-owned passenger cars. Only a limited quantity of the tubeless tires are being offered for sale by the company.

Loosli Promoted by Calco

Alden R. Loosli, who has been associated with the Chemicals and Intermediate Sales Department of the Calco Chemical Division of the American Cyanamid Co., has been appointed assistant sales manager of the Rubber Chemicals Department of the Calco Division. A native of Marysville, Idaho, Mr. Loosli attended the University of Idaho and the University of Chicago, where he obtained his B.S. degree in physical science. Joining Calco as a student trainee in 1937, he has held supervisory positions in the various production departments of the company's Chemical and Intermediate Division.

M.S.A. Ear Defenders, a product of the Mine Safety Appliances Co., Pittsburgh 8, Penna., essentially tapered tubes molded from a soft, non-toxic, elastomeric material, are said to provide a simple, inexpensive means of excluding excessive noise while permitting speech and warning signals to be heard.

A full-color 16mm sound movie which tells a graphic story of conveyor belts at work in underground mines is currently being distributed by Goodyear. Entitled "The Way Out," it is said to be the first successful color movie made in an underground mine.

NAMES IN THE NEWS

DR. C. W. WALTON, who has been manager of the chemical products development division of the Goodyear Tire & Rubber Co. since 1944, has joined the Minnesota Mining & Manufacturing Co., St. Paul, Minn., as assistant to R. P. Carlton, vice-president in charge of production, engineering, research, and development.

CARL PHARIS, chairman of the board of the Pharis Tire & Rubber Co., Newark, Ohio, has retired from that position in accordance with the company's retirement plan.

CLYDE HOOVER, formerly chief chemist of the Carr Manufacturing Co. and previously with the Essex Rubber Co. in a similar capacity, has returned to Essex Rubber as development manager at the company's laboratory.

CLIFTON M. BAYLISS, who has served as sales manager of the Detroit, Mich., district for the U. S. Rubber Co. since 1945, has been appointed manager of the company's drug sundries sales.

F. B. P. WEIL, managing director, and T. W. FAZAKERLY, general manager, of P. B. Cow & Co., Ltd., London, England, are on a tour of the United States and Canada in order to study conditions in the rubber and plastics industries in the two countries.

R. T. HULL, who has been associated with Emery Industries, Inc., since his recent release from the Army Air Forces, has been named Eastern technical representative of the company's "Plastolein" Products Department.

ANDREW FLETCHER, vice-president and treasurer of the St. Joseph Lead Co. since 1929 and executive vice-president since May, 1946, has been appointed president of the company, succeeding CLINTON H. CRANE, who has been named to the newly created position of chairman of the board of trustees.

DR. ONSLOW B. HAGER, formerly head of the textile chemicals evaluation and sales service laboratories of Rohm & Haas Co., has been appointed director of research and development of the Alco Oil & Chemical Corp., Philadelphia 34, Penna.

H. C. BEAL, formerly engineer of manufacture of the Western Electric Co., has been appointed vice-president in charge of manufacture by the company, succeeding STANLEY BRACKEN, who has been promoted to the position of executive vice-president.

H. D. FOSTER, formerly eastern sales manager of the mechanical goods division of the Goodyear Tire & Rubber Co., has been named manager of that division, with headquarters in Akron.

CHARLES MILLS, formerly associated with the B. F. Goodrich Co., recently joined the Corduroy Rubber Co., Grand Rapids, Mich., as factory manager, succeeding the late ED GORSUCH.

EDWARD H. BUCY, formerly assistant general manager of the Cellulose Products Department of the Atlas Powder Co., has been advanced to general manager, succeeding J. K. WEIDIG, resigned. In his new post, Mr. Bucy heads the sales and production activities of both the Zapon and Zapon-Keratol divisions.

J. W. ROBERTS, associated with the Goodyear Tire & Rubber Co. for many years, has been appointed to the position of chief works accountant over all domestic manufacturing operations.

DR. STEPHEN PALINCHAK, formerly research chemist at the University of Akron and previously connected with the Seamless Rubber Co. and the Ada Laboratories, has been appointed to the staff of the division of organic chemistry of Battelle Institute, Columbus, Ohio.

DR. STEPHEN J. ZAND has been appointed vice-president in charge of engineering of the Lord Manufacturing Co., Erie, Penna.

J. J. SHOMOCK, formerly associated with the Goodyear Tire & Rubber Co., recently joined the Pyramid Rubber Co., Ravenna, Ohio, as superintendent in charge of production, development and maintenance.

KENNETH H. KLIPSTEIN, who has been director of new products development of the Calco Chemical Division, American Cyanamid Co., has been appointed general manager in charge of the Division's development department, while V. E. ATKINS, who joined Calco in 1936 as an assistant divisional manager, has been named manager of manufacturing by Calco.

WILLIAM E. SIMKIN, of Philadelphia, who has served for the past eighteen months as arbiter for the Goodyear Tire & Rubber Co. and the Akron local of the United Rubber Workers of America (CIO), has been retained as arbiter in company-union grievances for nine Goodyear plants.

Boynton Heads RMA Division

At the annual meeting of the Coated Materials Division of the Rubber Manufacturers Association, held in Absecon, N. J., on May 22, N. Boynton, Jr., vice-president of Haartz-Mason, Inc., was elected chairman of the Division, succeeding Albert Dannenbaum, of the Aldan Rubber Co. Mr. Boynton was also appointed to the Division's Executive Committee for a three-year term, together with Winthrop Brown, Jr., general manager of the coated materials sales division of the Hood Rubber Co., and Fred N. Kite, vice-president of the Windham Manufacturing Co. J. P. Hach, of the Rubber Manufacturers Association, was re-elected secretary of the Division.

Bittaker Retires at General

Charles E. Bittaker, factory manager at the Akron plant of the General Tire & Rubber Co., has retired from active service after being associated with the company for thirty years. He will retain his connection with General Tire in a consulting capacity. A native of Akron, Mr. Bittaker has been in the rubber industry over forty years. He was first associated with C. C. Goodrich at the B. F. Goodrich Co. during the early days of that company. Joining General Tire in 1917 as a tire finisher, he organized the tire cord department, served as foreman of virtually every department in the plant and was made superintendent in 1943. He was promoted to factory manager in 1946.

DAVID L. FLANDERS, who has been associated with the B. F. Goodrich Co. since 1937, mainly in technical posts with the company's raw materials and development departments, has been named manager of the chemicals and pigments purchasing department, succeeding HAROLD W. CATT, who has been appointed manager of the textiles, paper products and advertising purchasing department.

ROBERT S. WILSON, vice-president and sales manager of the Goodyear Tire & Rubber Co., Akron, was recently awarded the Charles Coolidge Parlin Memorial Award by the Philadelphia Chapter of the American Marketing Association for outstanding contributions to broader perspective in marketing and market research practice.

THOMAS H. LATIMER, associated with the Black-Clawson Co. for the past ten years as chief engineer, has been appointed executive engineer in charge of engineering, drafting, and estimating of the John Waldron Corp., New Brunswick, N. J.

DR. CHARLES A. THOMAS, formerly vice-president and technical director of the Monsanto Chemical Co., has been appointed executive vice-president of the company.

Rubber Consumption in March

Consumption of rubber in March amounted to 98,422 long tons, bringing the total consumed for the first three months of 1947 to 296,818 tons, according to the Rubber Manufacturers Association. March consumption showed an increase of 4.4% over the 94,304 tons consumed during February. Of the total consumed in March, 43,072 tons were natural rubber and 55,350 were synthetic. During the first quarter of 1947, consumption of natural rubber amounted to 129,383 tons, as compared with 33,278 tons consumed during the first quarter of the preceding year, and use of synthetic rubber totaled 167,435 tons, against 204,977 tons for the corresponding period of 1946. In addition, the industry used 79,351 tons of reclaimed rubber in the first quarter of 1947. A total of 26,152 tons of reclaimed rubber was consumed in March, which is an increase of 2.6% over the 25,484 tons consumed during the previous month.

Seiberling Strike Settled

A thirty-six day strike of hourly-rated workers of the Seiberling Rubber Co. ended on May 16 after the union membership voted to accept a company proposal to end the strike. The company's plant in Akron was back on a full production schedule within five days after the vote. Terms of the back-to-work agreement between company and union include the rubber industry pattern 11½-cent-per-hour raise retroactive to February 2, with no changes in the existing contract. Company officials pointed out that these were the terms first offered to the union in March, before the strike began on April 11.

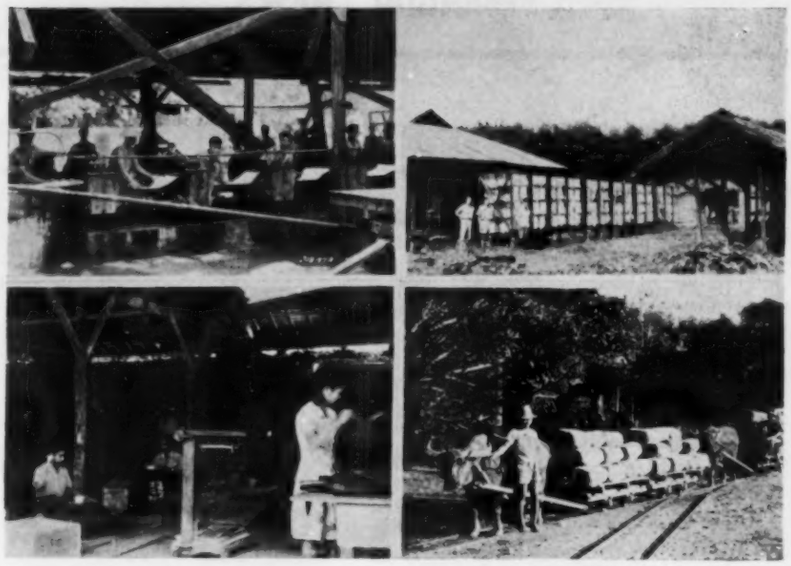
Falls Engineering Booklet

The resources of skilled manpower and equipment of the company are outlined in an attractive new booklet recently made available by the Falls Engineering & Machine Co., Cuyahoga Falls, Ohio. The company is currently celebrating its 30th anniversary. Products illustrated include the Campbell rubber tile cutting machine, Campbell-designed collapsible V-belt curing molds, and a new Campbell-designed soapstone dispenser. Harry L. Wright is president of the company, William J. Hunt, vice-president, Donald E. Richard, secretary, and S. W. Hawkins, general manager and treasurer.

Synthetic Plant for Sale

The synthetic rubber plant which was operated by the Goodyear Synthetic Rubber Corp. in Akron during the war has been offered for sale or lease by the War Assets Administration. Comprising sixteen buildings, the plant was used for the production of GR-S, and has a rated annual capacity of 30,000 tons. The Office of Rubber Reserve recently shut down this unit when it cut back the production schedule of synthetic rubber.

GOODYEAR PATHFINDER PLANTATION REACHES PRODUCTION CAPACITY



Some recent views of the Goodyear Pathfinder Plantation. Top, left: Milling sheet rubber. Top, right: Milled sheet rubber ready to enter the smoke house for drying. Bottom, left: Packing smoked sheet rubber in bales in temporary packing room. Bottom, right: Hauling bales of rubber to riverside dock for export.

The Goodyear Pathfinder rubber plantation in the Philippines has now reached peak production capacity less than two years after the Japanese were driven out of Mindanao, officials of the Goodyear Tire & Rubber Company have announced.

Aided by the absence of tapping for four years and the added maturity of the trees, a record yield of 1,000 pounds per acre is anticipated this year from the Pathfinder Plantation, located at Kabasalan, 60 miles northeast of Zamboana on Sibuguey Bay. Work of reclaiming the rubber plantation was started in July of 1945 but the area was not fully in tap until last May.

Factory facilities had been partially destroyed during the war years at Kabasalan and a considerable amount of equipment had been looted. Some buildings were completely burned. Since July, 1945, the work of rebuilding and re-equipping the plant has proceeded gradually. United States Army surplus materials have helped out in the rehabilitation work and now trucks and jeeps with trailers haul latex and smoked rubber sheets in competition with the ancient form of Carabao powered narrow gauge railroad.

Goodyear's Pathfinder development, restricted by Philippine law to 2,420 acres, has 2,371 acres in full production. The anticipated yield of 1,000 pounds an acre is more than twice that turned out by the average Malayan estate before the war. Goodyear is the only major rubber company in the Philippines although other American and Swiss capital have smaller and older plantations.

The Pathfinder Plantation represents only a fraction of Goodyear's rubber growing developments in the Far East. Nearly 55,000 acres had been planted in Sumatra out of a total of 87,000 acres leased when the Japs invaded the island. So far a Goodyear survey party has been unable to enter Sumatra to determine the present status of the company's Wingfoot and Dolok Merangir plantations.

Goodyear's Speedway estate in Costa Rica, consisting of 2,468 acres, starts producing for the first time this year. The trees are of a high yielding strain designed to resist leaf blight which has retarded rubber growing in Central American countries.

Firestone Builds Huge Tube

A mammoth tube, which is said to be the largest safety inner tube ever built, has been constructed by the Firestone Tire & Rubber Co., Akron, for use on commercial airlines. Consisting of a "tire" constructed of rayon cords within a heavy rubber air container, the tube, designated as the Life Protector Tube, was developed as a companion to the huge 70x25-28 tire produced by the company. The tube weighs 125 pounds, has an outside diameter of 63 inches and a section width of 23 inches. In the event of a tire failure from a puncture or blowout, a special valve within the tube is reported to hold sufficient air within the rayon emergency "tire" to permit landing of the plane without lurching or sideway which normally results from landings on flat tires. The tire for which the tube was developed has an over-all diameter of 70 inches and contains 24 plies of nylon. It will carry a load of 30 tons at 115 pounds air pressure.

FINANCIAL NEWS

Seiberling Rubber Co.

First Quarter: Net income of $263,135, which is equal to 66c a share, and which compares with $305,510, or 91c a share, for the corresponding period of the previous year. Net sales amounted to $7,759,712, an increase of 22% over the corresponding period of 1946, when sales totaled $6,269,339. The company attributed the decrease in net income to increased material and labor costs.

Rome Cable Corp.

Year Ended March 31: Net profit of $1,359,593 after deducting all charges, reconversion costs, and taxes, which is equal to $6.87 each on 189,830 common shares, and which compares with $398,973, or $2.10 a share, for the preceding fiscal year. Net sales amounted to $18,436,305 as compared with $16,975,009 for the previous fiscal year.

Norwalk Tire & Rubber Co.

Six Months Ended March 31: Net profit of $186,519, which is equal to 92c a share, and which compares with $220,196, or $1.01 a share, for the corresponding period of the previous year. Net sales amounted to $5,622,667, as contrasted to $5,160,514 for the similar period of the previous year.

Columbian Carbon Co.

First Quarter: Net income of $1,622,083, which is equal to $1.01 a share, and which compares with $1,267,783, or 79c a share, for the corresponding period of the previous year. Sales amounted to $10,530,681 against $8,125,041 for the first quarter of 1946.

A. G. Spalding & Bros., Inc.

Six Months Ended April 30: Estimated net income of $775,000, after deducting $695,000 for taxes, which compares with $465,000, after $400,000 tax charges, for the corresponding period of the previous fiscal year.

Jenkins Brothers

For 1946: Net income of $544,686, which is equal to $4.02 a common share, and which compares with $149,503, or 86c a share, for the previous year.

Thermoid Company

First Quarter: Net profit of $261,463, which compares with $35,210 for the corresponding period of the preceding year.

Lee Rubber & Tire Corp.

Six Months Ended April 30: Net profit of $1,391,635, which is equal to $5.76 a share, and which compares with $1,146,105, or $4.74 a share, for the corresponding period of the preceding fiscal year.

Belden Manufacturing Co.

First Quarter: Net profit of $419,476, which is equal to $1.44 a share on 291,640 common shares, and which compares with $122,566, or 46c a share, on 265,300 shares, for the corresponding period of the previous year.

Raybestos-Manhattan, Inc.

First quarter: Net profit of $620,863, which is equal to 99c a share, and which compares with $224,548, or 36c a share, for the corresponding period of the previous year.

Hewitt-Robins, Inc.

First Quarter: Net profit of $373,569, which is equal to $1.34 a share, and which compares with a net loss of $417,772 for the corresponding period of the previous year.

Anaconda Wire & Cable Co.

First Quarter: Net profit of $2,483,214, which is equal to $5.88 a share, and which compares with $6,233, or 1c a share, for the corresponding period of the previous year.

Stabelan A Stabilizer

A new stabilizer has been developed by the Stabelan Chemical Co., 837 Buckingham St., Toledo, Ohio, for use with plasticized polyvinyl halides and their copolymers. Designated as Stabelan A, the material may be used with the vinyls in all phases of production such as calendering of clear and pigmented film, fabric coating, extrusion, solvent solutions, and dispersions. The company claims that vinyl materials incorporating 3% to 6% of the dry resin content of Stabelan A show excellent resistance to discoloration, stiffening or embrittlement when exposed to the action of ultra-violet rays in an Atlas Fadeometer, or in accelerated weathering tests.

Plastic material with patent finish is now available for the first time in continuous lengths 54 inches wide. Called Patent Finish Naugahyde, it is a product of the U. S. Rubber Co.

Sets Up Consulting Service

Dr. James H. Boyd, until recently eastern representative of research and development for the Phillips Petroleum Co., has opened offices at 19 Rector St., New York 6, N. Y., as a chemical consultant on technical and economic problems. He will specialize in the economic appraisal of chemical markets, patents and projects in petroleum hydrocarbons, chemicals and emulsion polymerization. After graduating from Kenyon College in 1924, he did graduate work in chemical engineering at M.I.T., receiving an M.S. in 1926 and Sc.D. in 1930. Dr. Boyd joined Phillips in 1939 and was assigned in 1940 to the Hycar Chemical Co., where he supervised raw material procurement for synthetic rubber and conducted process cost and market studies. As technical advisor, Dr. Boyd assisted in the negotiations leading to the patent pools on styrene, butadiene, and copolymerization of the Office of Rubber Reserve. Since 1940, he has served on various technical committees for Rubber Reserve on synthetic rubber polymerization. He also worked with the Bureau of Explosives in developing procedures for the handling and transportation of butadiene.

Merix Anti-Static Compound

Although primarily developed to considerably reduce or eliminate static on plastic sheets or plastic molded parts, Merix Anti-Static Compound 79, a product of the Merix Chemical Co., Wrigley Building, Chicago 11, Ill., is reported by the company to work equally as effectively on both natural and synthetic rubber. Merix Anti-Static Compound 79 is a non-inflammable liquid which, if desired, may be easily removed by simply washing the plastic or rubber with water. It can be applied by dipping, brushing or spraying, and is said not to lose its effectiveness on storage.

Blast Wrecks Naugatuck Unit

An unexplained explosion blew the roof off one of the buildings of the Naugatuck Chemical Division of the U. S. Rubber Co. in Naugatuck, Conn., on May 31, causing damage estimated at $300,000. Fire followed the blast, which shattered the natural benzol unit of the company, blowing portions of the brick and wood structure as far as 150 feet. No one was in the plant when the explosion occurred.

Thermoid To Increase Stock

Stockholders of the Thermoid Co., Trenton 6, N. J., have approved increases in the authorized preferred stock from 55,000 to 120,000 shares and in the authorized common stock from 975,000 to 1,500,000 shares. A resolution has also been approved by the stockholders authorizing extension to April 16, 1951, of options to the management and employees to purchase 24,250 shares of common stock at $8 a share.

Wilmington Offers Glass Fabrics

Three new glass fabrics, with features of particular value to plastic processors, have been introduced by the Wilmington Chemical Corporation, 10 East 40th St., New York 16, N. Y. These are: Modigliani Elastic Glass Fabric, of a specially controlled texture, pliable with the added property of conformability to random shapes, resembling conventional elastic in construction; Modigliani Flexible Glass Fabric, an oriented structure of continuous glass monofilaments in sheet form, useful wherever fiber reinforcement of resins is required; and Modigliani Glass Veil, a refinement of the flexible fabric, said to be the only unwoven glass fabric available in super-thin construction in the range of 2½ to 5 mils thickness. All of these fabrics can be used alone or in combination with other materials as reinforcements for sheet, laminated, or shaped plastic products. They are compatible with polyesters and other resins commonly used in plastic reinforcement.

Cabot Holds Price Lines

Owen J. Brown, Jr., general sales manager of Godfrey L. Cabot, Inc., of Boston, Mass., announced on June 4 that there will be no increase in the prices of ordinary rubber grades of carbon black during the third quarter of the current year. Quotations on both channel and furnace types of Cabot black, he said, will remain stationary until the end of September. Thomas D. Cabot, vice-president and treasurer of the company, stated the decision to hold the price line had been made in spite of rising manufacturing costs and was taken to join the fight of business leaders against inflationary tendencies by holding prices at present levels.

McCreary Announces Neoprene Tire

McCreary Tire & Rubber Co., Indiana, Penna., has officially introduced a premium quality passenger car tire made of neoprene. Four popular sizes are now being made, but distribution for the time being is being limited to dealers east of the Mississippi. According to Harry C. McCreary, president of the company, the new neoprene tire will outwear ordinary rubber tires by more than 100 percent. The longer life is attributed to neoprene's greater resistance to heat, which permits a 60% thicker tread.

Data on Research Reports

Information on the organization, writing, and mechanical make-up of reports for the average research laboratory is contained in a study which has been made available by the Evans Research & Development Corp., 250 East 43rd St., New York 17, N. Y. Entitled "The Essentials of a Good Report," the study provides information to the executive researcher in properly presenting the results of his work.

Machine-Wrapped Oranges

Oranges from Florida are moving to market in limited quantities in a "second skin" of transparent, moisture-proof Goodyear Pliofilm which is reported to

preserve the tree freshness of the juice-heavy fruit and reduce weight loss and spoilage. This "second skin" is applied to the fruit by a novel and complex machine capable of "dressing"as many as 800 oranges in a single minute. The cost on a volume production basis is estimated at about one-tenth of a cent per orange. Designed and built for the Curtiss Candy Co. by William S. Cloud, Chicago inventor and engineer, the machine is now in operation at the Oak Hill Co-operative Fruit Packing House, Oak Hill, Florida. The operating principle of the machine is indicated in the accompanying illustration.

Selective List of Reports

For the convenience of businessmen and researchers, the Office of Technical Services, Department of Commerce, Washington 25, D. C., has prepared selective lists of technical reports and documents available from OTS in 13 specialized industrial fields, including plastics and adhesives. Each of the lists cites author, title, price and reference number of the reports included. They contain only the more important materials available in each of the selected fields. Copies of the selective lists can be secured direct from OTS.

Investigating Ceylon Problems

A special commission, consisting of S. F. H. Perera, E. W. Whitelaw, and Dr. A. Sunderalingam, is currently investigating the problems facing the rubber industry in Ceylon. Specifically, the commission is investigating the following points: (1) How best Ceylon rubber can be put on an economic basis; (2) What extent of the present acreage under rubber can profitably continue to remain; (3) What extent of such acreage can be profitably planted with other products; (4) What assistance should government give owners.

Revise Indonex Bulletin

The Chemical Products Department, Standard Oil Company (Indiana), 910 So. Michigan Ave., Chicago 80, Ill., has issued a revised edition of its general bulletin on its Indonex Rubber Plasticizers. This bulletin, known as General Bulletin No. 13, covers properties and general compounding data on the plasticizers. In addition to the general bulletin, the company has also issued a number of circulars on specific applications of the Indonex plasticizers, including its use in butyl rubber compounds, butadiene-acrylonitrile copolymer compounds, neoprene compounds, tire carcass compounds, footwear and heel compounds, camelback, motor mount and bumper compounds, wire jackets and other extruded compounds, GR-S packing compounds, hose compounds, hard rubber compounds, etc. Copies of any or all of these circulars can be secured on direct application to the company.

Organize Enduro Rubber Co.

Melvin S. Lower, formerly general manager of the Lower Rubber Division of the Chamberlain Engineering Corp., Ravenna, Ohio, has organized his own rubber manufacturing company under the name of the Enduro Rubber Co., Chestnut and Lake Sts., Ravenna. The new company, employing approximately 25 persons, will produce molded rubber products at its new plant, which contains 6,400 square feet of floor space. The company's present output is devoted almost exclusively to a line of orthopedic supplies made of soft and sponge rubber. Officers of the new firm include: Melvin S. Lower, president and treasurer; E. J. Smith, vice-president; and Herbert Lower, secretary and assistant treasurer.

Shortages Hit Tires in Europe

The shortage of carbon black is hampering tire production abroad even more than it is in this country, according to E. J. Thomas, president of the Goodyear Tire & Rubber Co., Akron, who recently returned from an inspection trip to Europe. Mr. Thomas went to Germany with a group of American industrialists to inspect production facilities there and then visited Sweden and England. Mr. Thomas predicted that unless their carbon black imports increase, tire factories in England and Sweden may have to shut down.

To Build Oil Processing Unit

Swift & Co. has awarded engineering and equipment contracts for an industrial oil processing unit which the company plans to build at Hammond, Ind. The unit, which is expected to be completed in 1948, will process special oils for use in the manufacture of rubber, textiles, soap, cosmetics, linoleum, paint, lubricants, and many other industrial products.

OBITUARIES

Emmet Sheahan

Emmet Sheahan, assistant to the president of the U. S. Rubber Co. and a leading figure in the rubber and automotive industries, died at his home in Detroit, Mich., on May 23 at the age of 58. He had been ill for two weeks following a heart attack but had returned home from a hospital when it was believed he had recovered.

A native of Detroit, Mr. Sheahan studied at the University of Detroit and was graduated from St. Mary's College in St. Mary's, Kansas. His career with U. S. Rubber began in 1916 when he joined the company as a salesman for solid rubber tires. Later he was transferred to the company's automotive department and in 1928 became its sales manager. The next year he was named manager of the original equipment department and in 1934 operations manager of the Detroit and Indianapolis plants as well as in charge of sales of the company's products to automobile manufacturers.

Mr. Sheahan was made general manager of the automotive division of the company in 1938 and general manager of its tire division two years later. In 1942 he was appointed to the position he held at the time of his death.

Mr. Sheahan, who once played baseball in the Kansas State League, was an ardent follower of sports activities. He was an active member of the Question Club, a national organization stemming from the early days of the automotive industry. He was a director of the National Bank of Detroit and the Detroit Athletic Club, and a former director of the Bloomfield Hills Country Club. He was also a member of the Detroit Club and the Detroit Boat Club. A widow, two sons, and a daughter survive.

Collins O. Buckmaster

Collins O. Buckmaster, manager of Kraft service and accessory sales of the General Tire & Rubber Co., died at the St. Thomas Hospital in Akron on May 24 following a week's illness. He was 63 years of age. Connected with General Tire for twenty years, Mr. Buckmaster had formerly been associated with the Miller Rubber Co. in a sales capacity. Three daughters survive.

Perry R. Richards

Perry R. Richards, executive vice-president and treasurer of the Sun Chemical Corp., died in the Bryn Mawr Hospital in Bryn Mawr, Penna., on May 20 after a long illness. He was 66 years of age. A widow and daughter survive.

Woodburn C. Winings

Woodburn C. Winings, manager of the mechanical goods division of the Goodyear Tire & Rubber Co., Akron, died on May 10 in a Brunswick, Ga., hospital after a short illness. He was fifty-four years of age. Mr. Winings was stricken with a cerebral hemorrhage two days earlier while on a vacation at Sea Island, Ga. He had gone there April 27 after conducting an annual sales conference for his division in New York. A native of Indianapolis, Ind., Mr. Winings attended Wabash College and joined Goodyear in 1915 as a salesman. After holding sales posts in Indianapolis and Chicago, he was transferred to Akron in 1928 as assistant manager of the company's mechanical goods division, and became manager of the division in 1930. During World War I, Mr. Winings served overseas as a Navy balloon pilot. He was a Mason and a member of the Portage Country Club. A widow survives.

Paul C. Searles

Paul C. Searles, who helped organize the now defunct India Rubber Co. in Akron in 1918 and who served as its secretary-treasurer until his retirement in 1928, died in Clearwater, Florida, on May 16. He was 77 years of age. Born in Wellington, Ohio, in 1870, Mr. Searles was associated with an architectural firm for thirty-three years before organizing the India Rubber organization. He was a 32nd degree Mason and had long been active in the Woodward Lodge. A widow, two sons, and a daughter survive.

Harold I. Beadle

Harold I. Beadle, who retired recently as sales manager of new products of the Naugatuck Chemical Division, U. S. Rubber Co., was found dead at his home in Greenwich, Conn., on May 8. He was forty-six years of age and had suffered a nervous breakdown several months ago. The death was termed asphyxiation by hanging. Born in Lynn, Mass., Mr. Beadle served in World War I as a lieutenant in the Marine Corps. A widow, daughter, and two sons survive.

Edward Hicks

Edward Hicks, general manager of William Zinsser & Co., died at his home in Elmsford, N. Y., on May 12. Mr. Hicks had been associated with the Zinsser organization for twenty-two years, and also had directed the work of the information bureau of the American Bleached Shellac Manufacturers Association.

George E. Price, Jr.

George E. Price, Jr., purchasing agent of the Goodyear Tire & Rubber Co., died in the City Hospital in Akron on May 30 after a short illness. He was 57 years of age.

Born in New London, Conn., in 1889, Mr. Price was a graduate electrical engineer with degrees from Rochester Mechanical Institute and New York University. He joined the Goodyear purchasing department in Akron in 1922, and had been purchasing agent since 1936, directing the purchasing activities of all the company's plants in this country.

When Goodyear built its plant in Wolverhampton, England, in 1927, he spent a year there buying equipment and organizing a purchasing department. Prior to joining Goodyear, Mr. Price was purchasing agent at the Davis Bourneville Co., Jersey City, N. J., for nine years.

Mr. Price served in World War I and continued active in military affairs as a reserve officer. Early in World War II he served as wartime procurement officer of automotive equipment in Akron under the Assistant Secretary of War. In 1942 he was ordered to active duty and commissioned a lieutenant colonel in London, England, as a member of the General Purchasing Board of the European Theater.

One of the founders of the New York Association of Purchasing Agents, and a charter member of the national association, Mr. Price established the Akron chapter in 1922, serving two terms as president. He was later elected national vice-president for the Ohio district, and was elected president of the national organization in 1940. A son, Robert Price, who is associated with Goodyear's aviation products division in Akron, survives.

Raymond J. Simon

Raymond J. Simon, engineer of the Goodyear Tire & Rubber Co., died on April 22 following a heart attack at Port Elizabeth, Union of South Africa, at the age of 49. He had been in South Africa for fifteen months, supervising work on the company's Uitenhage plant. A native of Pittsburgh, Penna., Mr. Simon had served as construction engineer during installation of steam, water, and air facilities at all of Goodyear's new plants for the past thirty years. He was a member of the St. Sebastian's Church and of the Fraternal Order of Elks. A widow and daughter survive.

A new movie which explains in non-technical language the operating principles and the manufacture of the storage battery has been made available by the Bureau of Mines of the U. S. Department of the Interior for showings to various organizations in this country. In 16 mm. sound, the film, entitled "The Story of the Storage Battery," has a running time of 28 minutes.

LOS ANGELES NEWS

Lyle M. Geiger, director of research of the Neville Co., was the principal speaker at the technical session of the meeting of the Los Angeles Rubber Group, held on June 3. Speaking on "Hydrocarbon Resins in the Rubber Industry," Mr. Geiger illustrated his talk with slides showing the chemical components and make-up of various resins.

Hydrocarbon resins were said to be an important factor in the development of synthetic rubber during the war. As a result, today hydrocarbon resins are being used in the manufacture of tire tread, rubber heels and soles, and many other applications of commercial synthetic rubber.

An interesting series of color slides illustrated the complex machinery used in the cracking process of gases, whereby the resin is drawn off into a series of tubes through several heating processes.

William J. Thomas (Firestone) presided as chairman, and welcomed Mr. Geiger as a new member of the Rubber Group.

Napoleon Hill, associate author with Andrew Carnegie of the book, "Think and Grow Rich," addressed rubber group members at the dinner meeting. He expounded his philosophy of "Going the Extra Mile," as the basic reason for the success of a great many of the country's leaders. The "Extra Mile" was represented as the willingness on the part of an individual to give more than he takes.

The meeting of the Group also featured a report by Jack C. Ballagh (Patterson-Ballagh) on his recent trip throughout England and European countries. Mr. Ballagh emphasized the inflationary economy running amok in those countries, especially in regard to the blackmarketing of luxury items. $125.00 was paid for a dinner for five people; two orchids were sold for $35.00; coffee called for a price of $6.00 per pound.

Rubber Group members were also entertained with an interesting sound film produced by the Corning Glass Works, and entitled "Glass for Science." Al Pickard (Braun Corp.) arranged for the showing of the film.

According to a statement made recently in Los Angeles by Herbert E. Smith, president of the U. S. Rubber Co., the rubber industry in 1947 will produce goods valued at $2,750,000,000. He pointed out that the industry is expected to consume over 1,000,000 tons of rubber this year, including approximately 537,000 tons of natural rubber and about 500,000 tons of synthetic. Mr. Smith predicted a high level of activity in the rubber industry through 1950, due to both the increased demand in this country and abroad.

Howard Wiley, formerly of U. S. Rubber Co., has been appointed factory manager for Rubbercraft Corporation.

William J. Thomas (Firestone) received the congratulations of the rubber industry upon his recent marriage. Mr. Thomas is Chairman of the Technical Group of the Los Angeles Rubber Group.

Phil Drew (Goodyear), Associate Chairman of the Los Angeles Rubber Group, and other members of the Group attending the Rubber Division of the A.C.S. Convention at Cleveland, have invited that group to hold their 1948 Fall Meeting in Los Angeles.

The return to production of the company's premium white sidewall tire after an absence of six years, was recently heralded by the U. S. Rubber Co. with two ceremonies in Los Angeles. In one ceremony, D. W. Walsh, Pacific Coast Manager of the company, presented a plaque to William Jeffers, retired president of the Union Pacific Railroad and wartime rubber director, which expressed the sentiments of the nation's rubber men in assuring rubber supplies which has made possible the present record-breaking tire production pace. In another ceremony, Mr. Walsh presented a safe driving award to Alexis Smith, star of "The Two Mrs. Carrolls," at the Warner Brothers Studios.

The B. F. Goodrich Chemical Co. has moved its local sales office from 1248 Wholesale Street to Room 509, 714 West Olympic Boulevard. The new phone is Richmond 0653. R. E. Bitter, West Coast sales representative, is in charge of the new office. Warehouse facilities are being maintained at the Wholesale Street address.

General Electric Co. recently began operations at its newly-constructed plant for the manufacture of its well-known Glyptal alkyd resins at Anaheim, California. The new plant consists of six structures comprising 35,000 square feet. Company officials said that the plant, a unit of the G-E Chemical Department, was established to better supply the increasing number of users on the west coast and in the Orient. Heretofore, production of Glyptal resins was confined to the company's Schenectady, N. Y., plant.

Exhibiting Tire Cord Machine

A German textile machine of special interest to American tire manufacturers and yarn processors will be exhibited at the textile research department of the American Viscose Corp. at Marcus Hook, Penna., from June 16 to 30. The machine, called a Barmag Two-for-One Twister, is the first textile machine to be brought to this country as a result of the investigation of German technology by American experts. The particular machine to be displayed at Marcus Hook is a full scale experimental model. Investigators who found the machine report that it was widely used in Germany to make rayon cord for tires. Reservations are necessary to visit the exhibit. They should be made with Dr. William D. Appel, Chief, Textile Section, National Bureau of Standards, Washington 25, D. C.

Dutrex 7 Plasticizer

A heavy process oil, called Dutrex 7, has been developed by the Shell Oil Co., 50 West 50th St., New York 20, N. Y., as a plasticizer for natural rubber, GR-S, and neoprene. Greenish brown in color, the material has a specific gravity, 20/4, of 1.0, a viscosity at 100° F. of 956 cs. and at 210° F. of 18.8 cs., and a flash point of 440° F. As a result of its intermediate viscosity and excellent compatibility, it is reported to have shown twice as rapid incorporation on the mill than conventional light process oils. Compounds containing Dutrex 7 are said to possess the following characteristics: low batch temperature; low Mooney viscosity; smooth milling; good physical properties; particularly good resilience; and low heat build up.

Acquires Forbes Varnish Co.

Pittsburgh Plate Glass Co. has acquired the business of the Forbes Varnish Co., Cleveland, Ohio. Consisting of fifteen plant and office buildings on a seven acre tract of land, the new unit will continue operations as the Forbes Finishes Division of the Pittsburgh Plate organization. Charles H. Reed, president of the Forbes Varnish Co. for the past eleven years, has been appointed director of the Division, which will manufacture oleoresinous, phthalic alkyd, alkyd urea-melamine, and nitrocellulose coatings.

Vinyl Plant Starts Production

Production of vinyl resins has started at the recently completed Niagara Falls, N. Y., plant of the Pathfinder Chemical Corp., subsidiary of the Goodyear Tire & Rubber Co. The resin produced at the plant will be used by the Goodyear chemical products division at Akron to manufacture a variety of calendered, extruded, and other vinyl plastic products. Frank Manchester is manager of the new plant, which consists of five processing buildings on twelve acres of land.

CANADIAN NEWS

A forecast that Polymer rubber may soon invade the British market to compete with natural rubber on its own stamping grounds was recently made by J. R. Nicholson, vice-president and managing director, Polymer Corporation. Reporting on his recent trip to Europe, Mr. Nicholson assured his audience that it is not wishful thinking to say that there is ground for optimism regarding future market possibilities in the United Kingdom.

"Increasing interest in butyl is being shown by the realistic businessmen of the British rubber processing companies," he said. "They recognize not only that our butyl can be laid down at their factories more cheaply than natural rubber, but also that for certain purposes butyl is superior to natural rubber. One English company has already decided that it would be out of step with the times if it didn't make a premium butyl inner tube."

Mr. Nicholson announced that John Riddell, former rubber controller for the United Kingdom, in behalf of his company, Rucker & Bencraft, has accepted the appointment as Polymer representative in the British Isles.

The vice-president pointed out that Britain is now using 150,000 tons a year of rubber as against a pre-war consumption of 90,000 tons. "The lowest estimate of possible use of Polymer types of rubber in Britain is five per cent," he said. "If this materializes, it would mean annual sales to the United Kingdom of 7,500 tons a year, or the equivalent of two months' production at Sarnia."

Failure of Canadian rubber companies to advance adequate wage offers has resulted in strike votes being ordered in all locals of the United Rubber Workers of America (CIO-CCL), it was announced last month following a policy committee meeting of the union in Stratford, Ontario.

Decision to instruct the locals, which represent some 12,000 rubber workers, to take strike votes came after local representatives reported to the committee that the rubber companies are attempting to meet union demands for a 20-cent-hourly wage increase with offers of five cents an hour.

This year, it was stated, the union instead of insisting on an industry-wide standard settlement of the wage question will leave each of its locals free to negotiate its own settlement. This could mean, it was explained, that many individual strikes, if such became necessary, could develop in place of the industry-wide walkout which was one of the feature strikes of last summer's industrial upheaval in Canada.

A new collective labor agreement providing work adjustments for 1,000 employes of the British Rubber Company, Lachine, Que., has been signed by officials of the firm and the Rubber Workers Federal Union, Local 214.

The contract reduces the work week from 50 to 45 hours and maintains the same take-home pay. Improvements in the vacation-with-pay plan, seniority and grievance procedure and changes in methods of determining time standards also are included.

In order to eliminate the confusion caused by the practice of tire manufacturers in using various names to designate different types of farm tires, it has been decided to establish uniform markings for all types.

As rapidly as possible, molds at all Canadian rubber manufacturers' will be changed to conform with the program. The current designations include:

Single Rib—F-1	Implement—1-2
Triple Rib—F-2	Traction Imple-
Multiple Rib—F-3	ment—1-3
Sure Grip—R-1	Plow Tail
Cane & Rice—R-2	Wheel—1-4
All Tractor—R-3	Hillside Com-
Garden Tractor—G	bine—1-5
Rib Implement—1-1	Smooth Tread
Sure Grip	Implement—1-6

All competitive makes in Canada will carry these new initial and numerical markings.

The possibility in Sarnia of a chain of explosions similar to those which demolished Texas City, Tex., is very remote, safety engineers of the chemical and oil refinery plants which comprise the bulk of local industry agreed recently. Like Texas City, Sarnia is a port and is located on the mile-wide St. Clair River across from Port Huron, Michigan. Texas City, on the Gulf of Mexico, is 11 miles from Galveston.

The bulk of the industry in both cities is the manufacture of chemicals. Sarnia has the British Empire's largest refinery, operated by Imperial Oil, Limited, also the $50,000,000 Crown-owned Polymer Corp., which manufactures synthetic rubber and by-products.

A rise in the use of synthetic rubber in Belgium was forecast by Etienne Sepulchre of Brussels, Belgian agent for Polymer, who toured the plant recently. This rise will be speeded, he said, by further technical assistance.

The rubber industry in Belgium, said Mr. Sepulchre, has regained 85 per cent of its prewar output, and is rapidly approaching complete restoration.

Said Mr. Sepulchre, "I have the utmost confidence in the potentialities in Belgium for a permanent trade in synthetic as produced by Polymer Corporation."

The only man living who has gone over Niagara Falls is reported to be planning a rubber ball, 12-feet high, in which to reepat his triumph over nature.

Jean Albert Lussier, a 53-year-old machinist, plummeted 170 feet down the Horseshoe Falls in 1928. He made that trip in a rubber ball weighing 758 pounds. The new ball will not only outweigh the original, but will be equipped with all modern conveniences including two-way radio and storage space for food and water.

In a recent letter, C. D. Howe, Canadian wartime Minister of Munitions and Supply, expressed the appreciation of the Dominion Government to George W. Sawin, president of the B. F. Goodrich Rubber Co. of Canada, for his services on the Rubber Advisory Committee.

Mr. Sawin was a member of this committee, formed in 1940. During the war it advised the Rubber Controller on matters such as the stockpiling of crude rubber and restrictions on its use. Early in the war, it pointed out the necessity of building a plant to produce man-made rubber.

The British Rubber Company of Canada, Limited, Montreal, of which A. L. Mailman is president, has purchased the chain of shoe stores in the Province of Quebec operated by J. B. Lefebvre, Limited, known as the Montreal Shoe Stores. There are nineteen stores, all located in the Province of Quebec.

Ira G. Needles has been appointed vice-president and general sales manager for the B. F. Goodrich Rubber Co. of Canada. He has been with Goodrich for 32 years, the last 22 in Canada.

To Expand Bristol Plant

Expansion of wire production facilities has started in the Bristol, R. I., plant of the U. S. Rubber Co. The expansion involves purchase of more than $1,000,000 worth of rubber and plastic insulating equipment from the government and other sources. The additional facilities are expected to increase the plant's capacity to three times its pre-war output. The bulk of the new machinery is designed for insulating wire by the company's patented Laytex dipping process.

Polyethylene Prices Reduced

Reductions in the price of Bakelite polyethylene plastic material, ranging from four to seven cents per pound on quantity lots, have been announced by the Bakelite Corp., 30 East 42nd St., New York 17, N. Y. Under the new price schedule, carload lots of polyethylene resin will sell for 49 cents per pound, while colored compounds based on this resin will sell for 56 cents per pound.

Step Up Your Sales

SUN RUBBER PROCESSING AIDS . . .

Mean Clear, Clean Colors . . . Without Blooming . . . Without Discoloration

Color is America's No. 1 salesman. It makes customers stop and look. It often makes the difference between a product that people will buy and one that they will pass by.

If you manufacture rubber goods in white or pastel shades and are bothered with "blooming" or discoloration, have a talk with your nearest Sun Engineer. Sun makes several different rubber processing aids for natural, neoprene, reclaimed and GR-S synthetic rubbers. Sun processing aids are widely used and have been "Job Proved" in scores of major plants.

Sun Rubber Processing Aids are highly compatible with the different rubbers for which they are recommended. They prevent "blooming" and discoloration. They make possible more attractive, longer-lasting colors. They speed up milling and aid plasticization.

To step up sales with clearer, brighter colors . . . to cut down manufacturing costs . . . call your nearest Sun office. Or write Department RA-6.

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

SUN

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INDUSTRIAL PRODUCTS

NEW RUBBER GOODS

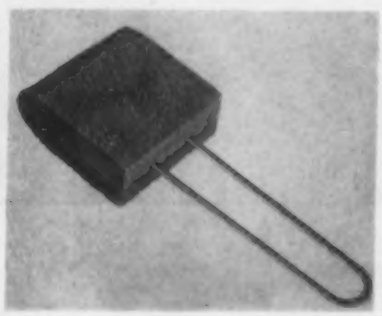
Sea-Net Speed Flippers

Sea-Net Manufacturing Co., 1428 Maple Ave., Los Angeles 15, Calif., has placed on the market speed flippers which, when attached to the feet, are said to

increase the speed and range of a swimmer up to 40%. Molded from soft rubber to fit the contours of the human foot, the flippers are adjusted by loosening or tightening the heel strap. The wide surface area is said to put extra power into a swimmer's kick and to take the effort out of water sports. The bottoms are flat, permitting the wearer to walk around in them without fear of slipping on wet decks or surfaces.

Peter Pan Neoprene Scourer

A new scourer for pots and pans and stove burners has been placed on the market by the Oliver Processing Co., 1580 East Slauson Ave., Los Angeles, Calif. Made of neoprene with a rustproof wire



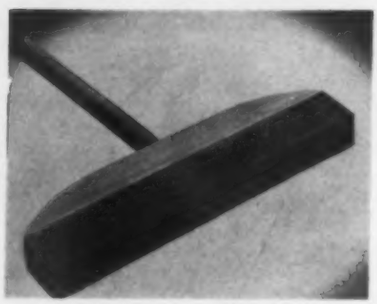
handle, the scourer has a 2½-inch by 2½-inch by 1-inch scouring area. The company claims that the scourer, called the Peter Pan Scourer, can also be used dry to remove lint from all types of clothing and upholstery.

Goodyear Glass Fiber Steam Hose

A new type of steam hose which employs spun glass yarn as a basic component to gain maximum heat resistance has been introduced by the Goodyear Tire & Rubber Co., Akron, for fighting stubborn refinery and oil well fires with live steam. Capable of carrying 200 pounds of saturated steam at 388° F. for more than 300 hours under continuous flexing, the new hose is said to increase greatly the steam volume used in smothering oil fires. The new hose is designed also for heavy-duty steam or hydraulic service in foundries, steel and paper mills, road construction, dock and railroad use.

Sani-Sweep Neoprene Broom

A new all-purpose broom made of neoprene with a wooden head and handle is being manufactured by the Oliver Processing Co., 1580 East Slauson Ave., Los Angeles 1, Calif. Designated as the Sani-Sweep Neoprene Broom, it is re-



ported ideal for household use. According to the company, the broom does not raise dust, nor scratch waxed floors, and will outlast the conventional type broom. The head of the broom is 11½ inches by 1 5/16 inches by 1½ inches, while the handle is four feet long.

Neoprene Crepe Soles

A new type of neoprene crepe sole for spectator-type and sport shoes has been developed by E. I. duPont de Nemours & Co., Inc., Wilmington 98, Del. It is claimed that the new sole is highly resistant to oil and heat and therefore does not soften on hot pavements or become slippery on oily surfaces; has less tendency to spread than natural rubber soles; and has superior wearing qualities. Like

natural rubber soles, the new crepe sole can be attached by using a neoprene type cement. It also may be stitched like leather or a vulcanized natural rubber sole and can be supplied in a variety of colors.

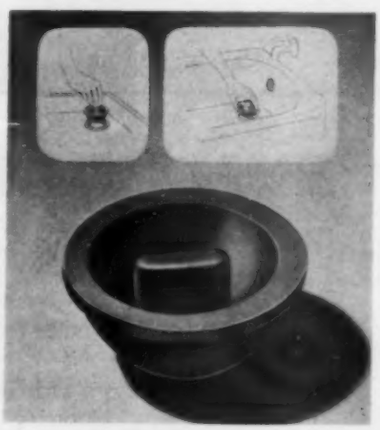
Com-o-Form Ball Cushion

The Com-o-Form Ball Cushion, which has been previously used in shoes as a built-in feature, has now been made available by the Modern Orthopedic Appliance Co., Inc., 109 West 26th St., New York 1, N. Y., as an accessory. Made

of sponge rubber, or an acceptable substitute, the cushion can be fitted into any type of shoe, completely cushioning and balancing the whole ball area of the foot, thus preventing strain and callous formation. It is also said to cushion and recess the heads of the metatarsals.

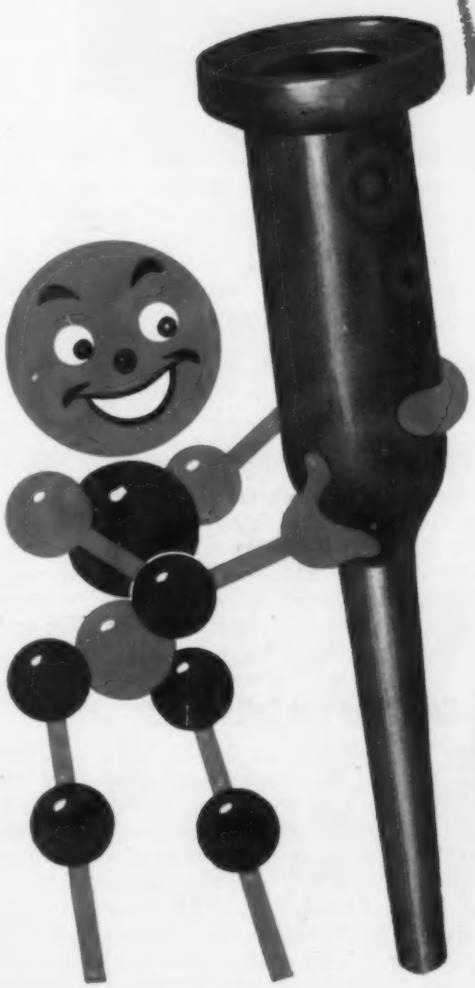
Sur-Seal Sink Stopper

Los Angeles Standard Rubber, Inc., 1500 East Gage St., Los Angeles, Calif., has introduced a new sink stopper which is said to feature an entirely new principle in rubber stoppers. Known as the Sur-Seal Sink Stopper, it has a convenient handle which is set flush with the sealing rim, thus eliminating the pos-



sibility of dislodging the stopper from the drain. The stopper fits flush with the drain top and can only be removed by the fingers. Slight pressure breaks the suction and the stopper is removed without undue tugging. The stopper is available in sizes ranging from three-quarters of an inch to two inches.

I've met a remarkable milkmaid...



Down on the farm...or in the home...Perbunan Nitrile Rubber is doing *many a remarkable job!* Take the example of the milking machine inflation shown here. It was developed during the war by the research and development engineers of the Ideal Roller & Manufacturing Company when natural rubber was no longer available.

After careful study, the engineers picked Perbunan because it gives longer life in contact with animal fats...longer life under the heat of sterilization...because Perbunan retains its flexibility in sub-zero weather...and because as an engineering material Perbunan is readily adaptable to complex molds such as the one required for this part.

Not only did Perbunan solve their problem...it developed an inflation *many times better than any they had ever made before!*

Another fact worth remembering is this: Perbunan now contains a new stabilizer that makes its use possible where delicate colors are desired...without objectionable discoloration of the rubber part after exposure to sunlight or ultraviolet light, and contact with a wide variety of fluids.

If you have any rubber compounding problems, our rubber engineers will gladly help you solve them. Please write to the office nearest you.

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THE RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

Enjay Company, Inc. (formerly Chemical Products Department, Stanco Distributors, Inc.) 26 Broadway, New York 4, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives: H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

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Weathering qualities of
RUBBER PRODUCTS
determined with reliable
accuracy in the

ATLAS *twin arc*
WEATHER-OMETER

Any selected cycle of exposure to sunlight and wetting can be set for automatic continuous testing in the Weather-Ometer. Exact tests can be duplicated at any time by settings on the control panel which contains temperature regulator—time meter—light and water cycle switch — automatic cut-off switch — voltage adjusting switch — direct reading thermal regulator — reactance coil (for economical current consumption). The Weather-Ometer is fully automatic in operation; can be left unattended over night; only necessary to renew carbons once in 24 hours. Years of exposure to any conditions of weathering reduced to a few days testing in the laboratory with the Weather-Ometer.

Originators and sole manufacturers of accelerated testing machines for over a quarter of a century. Fade-Ometer, Weather-Ometer, Launder-Ometer — the accepted standard testing machines used all over the world.

ATLAS ELECTRIC DEVICES CO.
361 West Superior Street, Chicago 10, Illinois

NEW EQUIPMENT

Wood Two-Opening Hydraulic Platen Press

Designed for vulcanizing rubber composition sheet packing or floor tile, a new two-opening multiple cylinder type hydraulic steam platen press has been added to the line of presses featured by the R. D. Wood Company, Public Ledger Building, Philadelphia, Penna. A 3400-ton press, it is also adaptable for vulcanizing rubber belting merely by adding stretching and clamping units, mounted at the ends to maintain proper belt tension.

Top and bottom platens are fabricated from eight heavily-ribbed close-grained Meehanite castings, of sectional construction rigidly connected to maintain proper alignment. The bottom platen is mounted

on Meehanite I-beam foundation rails. The one-piece moving platen is made from open hearth steel casting with heavily-ribbed box section construction. Movement is guided on the four center columns by half-round bronze-bushed Meehanite guide bearings, and on the four end columns by flat bronze bearings to assure proper adjustment when compensating for expansion and contraction of platen under changing temperatures.

Columns are of forged steel, and the cylinders are open hearth castings with bronze-bushed guiding throats. The steam platens are made of special process firebox steel plate, machined parallel within .003-inch with one end of each platen tapered and water cooled. The intermediate steam platen is column-guided, suspended by means of steel hanger rods and accurately spaced with the press in open position.

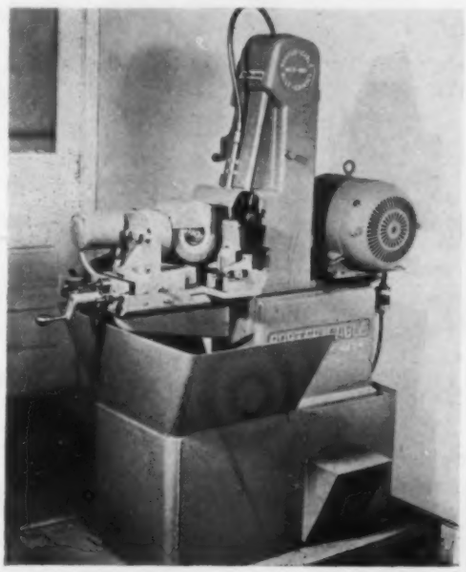
This new two-opening press can be furnished complete with steam and hydraulic piping, and control valves. To meet product requirements, other sizes and capacities can be furnished.

Centerless Wet Belt Grinder

A centerless wet belt grinder is the latest addition to the line of wet belt machines manufactured by the Porter-Cable Machine Co., Syracuse, N. Y. The new grinder is said to offer several advantages. An endless abrasive belt operates over a resilient contact roll. Since the abrasive belt and the contact roll are balanced, the two cut uniformly. The work is done by the abrasive belt; therefore, the contact roll gets little, if any, wear. This roll, which backs up the

abrasive belt, therefore remains flat across and square at the corners. Its diameter remains constant. This condition eliminates much truing and balancing. Changing abrasive belts on this centerless grinder is as easily and quickly done as on any abrasive belt machine. Seldom is it necessary to true up.

Since the grinding unit maintains a balanced condition and the contact roll remains flat and square, setting up is simplified so that less experienced men may handle the job. In addition a swivel head is provided and when necessary the contact roll is trued up on the machine itself and in its normal position.



The resiliency of the contact roll eliminates chatter. A soft resilient roll follows a shape and cleans up irregular stock. Semi-hard roll is recommended for accurate grinding.

The new centerless grinder handles a variety of operations and a popular range of sizes. It is adapted for through work, short pieces, ¾ inch to 2 feet lengths and longer, of course, with proper supports. Diameters handled range from 3/32 inch to 2¼ inches.

FOR FURTHER DETAILS, SEE AD ON PAGE 262

GAUGE MATERIAL *Before* MISTAKES and *Continuously* with the SCHUSTER MAGNETIC CALENDER GAUGE

No, lock the door *before* it's stolen. In this case, "it" means accuracy, production and profit. . . . Since 1927 the Schuster Magnetic Calender Gauge has consistently served four important ends:

1. It assures uniform thickness in your finished product, down to 1/1000".
2. It makes hand-miking unnecessary, saving time and expense.
3. It does away with the human equation, *preventing* mistakes.
4. It saves the stock sampled for calender testing.

The Schuster Gauge does these things by the simple expedient of setting rubber calender rolls to a desired thickness and holding them there. More lately, it has showed itself just as indispensable as "insurance" to synthetic rubber, plastics, cellulose and other materials. The instrument is simple in design, rugged in construction, practically without wearing parts, and adjustable to any thickness.

There is no "stock recipe". Every installation must be engineered to the job. May we tell you what the Schuster Magnetic Calender Gauge can do for you?

Write for our Bulletin "A"

THE MAGNETIC GAUGE COMPANY
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—SALES REPRESENTATIVES—
Eastern BLACK ROCK MFG. CO. Bridgeport, Conn.
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cut labor costs... save up to 80% in BALING time!

JEFCO Jute Tubing, Amazing New Baling Cloth with Exclusive Two-Way S-t-r-e-t-c-h, Fits Packages of All Sizes and Shapes.

Jefco Jute Tubing is a seamless, continuous, tubular baling cloth designed to save time and money in your shipping room. It differs from ordinary covering materials in its elasticity and flexibility, providing smooth, close-fitting coverage of a wide variety of shapes and sizes. Jefco Jute cuts labor costs substantially because it's so easy to use . . . and its durability, toughness, and abrasive resistance assure maximum protection for your package. Available in widths to fit a wide assortment of package sizes. Write for complete specifications today.

No fitting, no shaping, no time-consuming hand sewing with Jefco. You simply pull up the slack, clamp with a wire fastener and cut.

Jefco's smooth, snug-fitting coverage enhances the appearance of your package, makes friends for your product wherever it goes.

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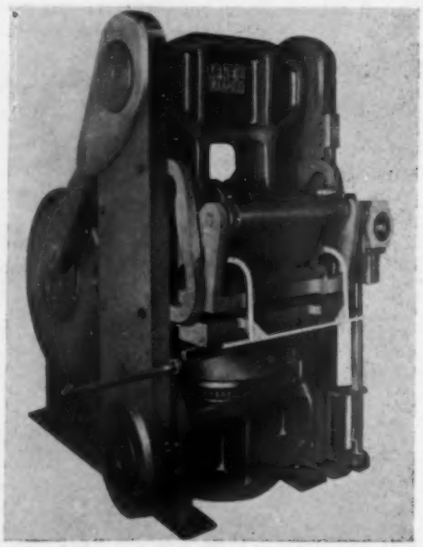
JUTE TUBING

A Product of
THE J. E. *Fricke* CO.
40 N. Front St., Phila. 6, Pa.
Mills at Hulmeville, Pa.

McNeil Mechanical Goods Press

The first of a new line of platen presses for mechanical goods, the McNeil Model 800-32-5, has been announced by the McNeil Machine & Engineering Co., 96 East Crosier St., Akron 11, Ohio. The new press features motor operation, with no hydraulic pressure, simple adjustment of lower platen, 800,000 pounds total pressure, 780 pounds per square inch platen pressure, and adjustment for mold loadings zero to 400



tons. The range of mold thickness varies from 1 inch minimum to 5 inch maximum or 2 inch minimum to 6 inch maximum. Hydraulic service, either water or oil, has been completely eliminated from the new press. There are no rams to pack, no valves to service, no pumps, and no accumulators. A single high torque motor is the only power requirement for press operation.

A specially-designed timer automatically controls curing time and any series of bumps which may be required. A direct reading load gauge on the upper right hand side arm simplifies adjustment of the press to obtain any predetermined mold loading. After the first cure, loads can be increased or decreased almost instantly. Molds are fastened to upper and lower steam platens, but changes can easily and quickly be made. Knockout equipment can be furnished by the manufacturer for rubber valve stems or other types of products which require automatic ejection. The present model has 32x32 drilled steel steam platens, but the company is preparing to offer a complete size range.

A new **Ellipse rotary pump** which handles oils, gases or water, is not sensitive to foreign bodies, and delivers high output at high vacuum, has been made available by the Ellipse Corp., 24 So. Clinton St., Chicago 6, Ill. It is reported to be of special interest to engineers concerned with hydraulic operations where small size, low power requirements, and high pressure performance are concerned. Performance claims are stated as being made with 150 viscosity oil at temperatures of 140° F.

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Rubber and Plastic Machinery

NEW — *Domestic and Export* — USED

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Accumulators	Platens
Aprons	Presses
Boilers, H. P.	Pumping Units
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Calenders	Refiners
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Complete Plants
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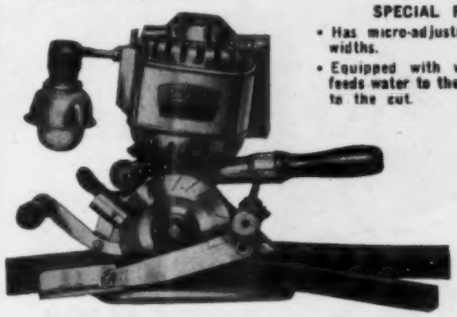
REG. TRADE MARK

RUBBER STRIP CUTTER

PATENTED

A PORTABLE machine capable of stripping slab rubber up to 1″ thick at the rate of 20,000 feet in 8 hours. Any width desired.



SPECIAL FEATURES

- Has micro-adjustment for accurate widths.
- Equipped with water tank which feeds water to the slotted knife and to the cut.
- Has repulsion-induction motor which carries any overloads.
- Automatic sharpener device keeps knife keen and sharp.
- Has base with rollers and is very easy to handle.

Cuts within 1/64 inch to 1/100 inch tolerance depending on grades of rubber. Cuts a slab down to the last shaving. Cuts all grades of rubber including pure gum, sponge, etc. Cuts squarely—no rejects.

Now in use by many leading Rubber Manufacturers & Jobbers

Simplex Cloth Cutting Machine Co., Inc.

Manufacturers of a Complete Line of Cloth Cutting Machinery
270 West 39th St. New York 18, N. Y.
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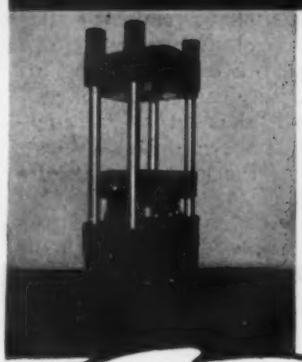
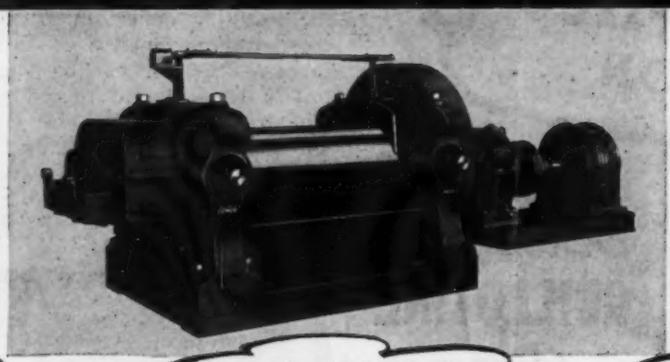


PRESSES



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EXTRUDERS • STRAINERS
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Three outstanding features are found in EEMCO Rubber and Plastics Processing Machinery. First, Correct Design; second, Sturdy Dependability; third, Built for Heavy Duty and Long Life with minimum repairs. Mills, Crackers, Refiners and Washers are furnished as single units, or for operation "in line" of two or more.

EEMCO Presses are made from 12″ x 12″ for Laboratory use up to sizes to meet all requirements. The New EEMCO Laboratory Mill (illustrated) is a fully enclosed, self-contained unit with variable speed drive. Streamlined, it is ideal for Laboratory and Small Production. Bulletins sent on request. *Write today for quotations & delivery.*

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953 EAST 12th ST., ERIE, PENNA.

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PROCESSING UNIQUE EQUIPMENT

FRIGIDISC GRINDERS

This exceptionally sturdy, ruggedly constructed mill grinds material to finished size. Built-in cooling device. Cooling-liquid is continuously circulated against the back of each grinder disc. Robinson Processing Equipment of every type . . . Crushers, Grinders, Sifters, Attrition Mills . . . is designed to your requirements by experienced engineers. Literature available. Inquiries invited!

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Plant: Muncy, Pa.
SALES REPRESENTATIVE
MERCER-ROBINSON COMPANY, INC.
30 CHURCH ST., NEW YORK 7, N. Y.

FOR YEARS OF
Trouble-free
OPERATION . . .

the new **4-MB**
Bench type
GUILLOTINE
Cutter

Specifically designed, and of sturdy construction, for cutting cured and uncured rubber or rubber like materials.

Fast . . Hand fed . . A roller type stop enables cutting rates up to 500 per minute.

WRITE FOR FULL PARTICULARS

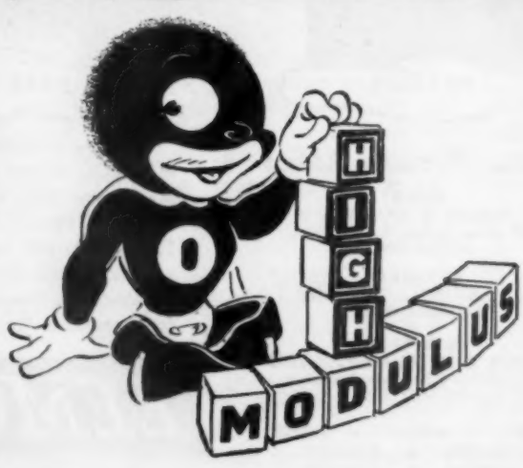
FINE BR TOOLS
BLACK ROCK MFG. CO.
179 Osborne Street Bridgeport 5, Conn.
Pacific Rep. Lombard Smith, Los Angeles, Cal. N. Y. Office, 261 Broadway

Sonntag Model SF-2 Fatigue Tester

A new bench-type fatigue testing machine with a "constant-force" loading feature has been introduced by the Baldwin Locomotive Works, Philadelphia 42, Penna., of testing all types of sheet stock. The unique design of the machine, known as the Sonntag Model SF-2, is claimed to eliminate the need for any electronic equipment, complex linkage, or special device to

Baldwin's new fatigue tester

maintain a constant force while the specimen is under test. The machine uses a revolving eccentric mass as a means of loading the specimen, avoiding cams or eccentric connecting rods which require readjustment during the test as the stiffness of the specimen changes. With this "constant-force" machine, the load is said to automatically remain constant regardless of the changes in the amount of deflection of the specimen. A predetermined load is alternately applied to the specimen, and the resulting deflection is incidental. Because of its comparatively small size—15 inches by 12 inches by 32 inches—the SF-2 can be placed in a cabinet during a test so that temperature and humidity can be controlled. The machine weighs 115 pounds, has an alternating force capacity of 20 pounds, and a speed of 1800 cycles per minute with a total travel of the loading yoke of one inch per cycle.



FOR FURTHER DETAILS, SEE AD ON PAGE 262

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Since 1849

Cementing & Vulcanizing Tools

HUNDREDS OF DESIGNS —

Scores of standard tools carried in stock for working rubber, leather, plastics, paper, cement, etc. Special tools made to your order. Also—steel letters, figures, stamps, dies and molds. Explain the job, we'll suggest the tool.

HOGGSON & PETTIS MFG. CO.
141A Brewery St., New Haven 7, Conn.

UTILITY FAN OR V-BELT COVERING MACHINE FOR VARIOUS SIZES AND CROSS-SECTION BELTS

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ROYLE STRAINERS

For Greater Efficiency

- **An easy, rapid flow of stock with but little rise in temperature**
- **Less time lost in cleaning and changing screens**
- **These are among the features that make the choice of a Royle Strainer a profitable investment**

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*DAREX
Copolymer
X34
A HIGH STYRENE RUBBER RESIN
FOR QUALITY, BRIGHT COLORED RUBBER PRODUCTS

Darex COPOLYMER X 34

gives you these properties in your rubber products:

- Increased stiffness and hardness
- Greatly improved abrasion and flex-cracking resistance
- Low specific gravity and *light color*

Darex X 34 is especially valuable and economical for clean looking, easily cleanable flooring and light colored molded mechanical goods. X 34 is stabilized with stalite antioxident. It may be readily blended with natural rubber, synthetic rubbers, or mixtures of the two. Usually processed in a hot Banbury, X 34 may be used in two ways:

1 In highly loaded compounds, five to ten parts give marked improvement in flex and tear resistance.

2 In low-loading, bright colored stocks, 20 to 40 parts give high hardness, superior abrasion and flex-cracking resistance, and low specific gravity.

Write for samples and recommendations for your products

FOR OPEN MILL MIXING, USE DAREX COPOLYMER NO. 3

DEWEY AND ALMY CHEMICAL COMPANY
DEPARTMENT 89 D
CAMBRIDGE 40, MASSACHUSETTS
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REVIEWS

BOOKS

Technology of Adhesives. By John Delmonte. Published by Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. 6 x 9 in. 516 pp. $8.00.

Although from a quantity production viewpoint, adhesives are not far removed from the figures for molded parts and surface coating materials, they have been deemed insignificant in the past in comparison with the more colorful and utilitarian molded, laminated, and cast plastics. Developments in adhesives, however, have closely paralleled those in high polymers, and this book ties together the developments in plastics with those of adhesives.

The book is probably the most complete one yet issued covering the technology of adhesives. After his introduction, including a classification of adhesives, the author treats with adhesives based on phenolic resins, urea and melamine resins, miscellaneous thermosetting resins, polyvinyl resins, polystyrene and acrylic resins, the thermoplastic synthetic resins, cellulose derivatives, protein substances, vegetable glues and natural resins, animal glues, and sodium silicate. In addition there are chapters devoted to theories of adhesive action; adhesives for wood, tapes, papers, cloths and foils; inorganic materials; tests and specifications; and the cementing of organic plastics.

Rubber comes in for a good deal of attention. There is a 51-page chapter devoted to "Rubber Adhesives" and a 22-page chapter to "Adhesives for Metal and Rubber." Specific tests for rubber adhesives are discussed in the chapter on "Tests and Specifications for Adhesives." The chapter on "Rubber Adhesives" touches on latex adhesives, the solvent type of rubber cement, cyclized rubber cements, phenol-modified rubber adhesives, oxidation effects on rubber products, olefin polysulfide cements, synthetic rubber cements, chlorinated and cyclized synthetic rubber cements, etc. Rubber-to-metal assemblies are covered in the chapter on "Adhesives for Metal and Rubber."

There are twenty chapters in all, plus an extensive combination author and subject index. References to authors are printed in the past in comparison with the more colorful and utilitarian in italics for the reader's information. In addition, extensive bibliographical references appear at the end of each of the chapters.

•

Molding and Casting. (Second Edition). By Carl Dame Clarke. Published by The Standard Arts Press, 2635 No. Calvert St., Baltimore 18, Md. 8 x 11 in. 306 pp. $6.50.

Considerably larger both in physical size and contents from the first edition issued in 1938, this new edition of "Molding and Casting" brings the subject matter up-to-date and includes several new chapters. Like the first edition, it outlines methods and given formulas necessary for the molding and casting of numerous materials in the field of science. Materials covered include rubber, plaster of Paris, sulfur, wax, agar, positive resin-wax materials, balsams, gums, celluloid, glue, etc. Subjects discussed include separating mediums, general and special techniques, squeeze molds and closed molds, prostheses, waste molding and casting of large subjects, patines and color finishes for plaster and imitation stone casts, and metal plating of casts and molds. Because of the growing importance of rubber molding and casting this chapter has been greatly enlarged and simplified techniques described. A special chapter on the control of expansion and contraction of rubber casts is now included. Another new chapter is devoted to rubber moulages for first aid training. The new edition is a considerable improvement over the first one.

ALL RUBBERS B-O-N-D-E-D

TO RAYON-NYLON-COTTON

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Bond-it

BOND-IT is a thermo-setting elastic compound recommended as an adhesive for bonding all types of natural and synthetic rubbers to Rayon, Nylon, cotton and glass fabrics, yarns, cords and fibers.

Write today for sample and complete technical data on this excellent bonding agent.

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Manufacturers of RUBBER-GLO and ESTAC

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SULPHUR and CHEMICALS

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Commercial Rubbermakers' Sulphur, Tire Brand, 99½% Pure

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safeguard against dust

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ANTI ADHESIVE

IN LIQUID FORM . . .

TEXOLUBE-R

Applied by spray, dipping or brushing TEXOLUBE-R forms a continuous unbroken coating. Even when spray applied, there is no danger of bubbles, surface breaks or unprotected areas. TEXOLUBE-R is easier to handle and easier to use. Forty percent solid content . . . shipped as a fluid concentrate, not a paste, it is always ready for use . . . always easily and accurately measured and mixed.

TEXOLUBE-R produces a "tack-proof," exceptionally tough, transparent film on all types of rubber, and has no harmful effect in any subsequent operations.

Send for free gallon sample or full drum on ten day trial basis.

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CINCINNATI 7, OHIO

TEXO

Technological and Physical Investigations on Natural and Synthetic Rubbers. By A. J. Wildschut. Published by the Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y. 5½ x 8 in. 172 pp. $3.00.

Issued as part of the current series on the Progress of Research in Holland during the war, the purpose of which is to prove that scientists in the Netherlands remained active during the five years of German occupation, this monograph discusses investigations in the field of rubber and rubber-like materials carried out during the period between the summer of 1939 and that of 1944. With some exceptions, the experimental work described was accomplished by the author and his co-workers. Mr. Wildschut is a research engineer of the Rubber Foundation at Delft.

Divided into two sections covering technological and physical investigations, respectively, the book consists of nine chapters, as follows: (1) Standard Measurements; (2) Miscellaneous Investigations; (3) Modification by Means of the Vulcanization Process; (4) Physical Methods in Structural Research; (5) Measurements Concerning Plasticity and Elasticity of Vulcanized Rubbers; (6) Mechanical Properties Under Special Circumstances; (7) X-Ray Investigations; (8) Some Electrical Investigations; (9) General Conclusions.

Some of the investigations were carried out under extremely difficult conditions and the author stresses the fact that due to the war situation only a limited amount of literature was available for consultation. American and British literature was especially scarce. Nevertheless, the results reported should prove a valuable contribution to the technical literature of the industry.

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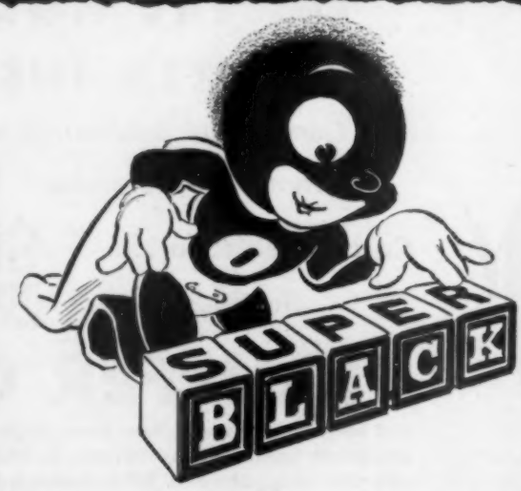
Plastics and You. By Stephen Bass. Published by the Eastwood-Steli Co., 1440 Broadway, New York 18, N. Y. 5½ x 8 in. 190 pp. $2.75.

In view of the fact that hardly a day goes by without some reference to plastics in the daily press, it is not surprising that the average individual is somewhat confused by it all. This book is intended to dispel most of that confusion. It is the story of plastics, told in simple language with technicality reduced to the minimum. It tells how they are made and how they are used. In condensed form, the author discusses the numerous commercial plastics, from the phenolics to the vinyls, stressing the particular advantages offered by each type. In addition, a special chapter is included on employment opportunities, the branches offering the most openings, the requirements and nature of the work, and how long it takes to get experience. A list of manufacturers and trade names is included, as well as a list of books and periodicals on plastics.



FOR FURTHER DETAILS, SEE AD ON PAGE 262

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REVIEWS (CONT'D)

Physical Constants of Hydrocarbons. Vol. IV. Polynuclear Aromatic Hydrocarbons. By Gustav Egloff. Published by the Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y. 6 x 9 in. 540 pp. $17.50.

Continuing the arrangements made with the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in 1919, under which the National Research Council, in cooperation with the American Chemical Society and the American Physical Society, undertook the production and publication of Critical Tables of Chemical and Physical Constants, this latest volume of the series is a collation of all melting point, boiling point, density, and refractive index data available on polynuclear aromatic hydrocarbons. The principal source of these hydrocarbons is coal tar, but some of the compounds are also found in petroleum and other natural sources, and many are produced synthetically. The author points out in his preface that the thousands of known compounds reproduced in the volume represent only a small fraction of the theoretical possibilities.

•

The Plastics Buyer: 1947. Published by the Cleworth Publishing Co., Inc., 551 Fifth Ave., New York 17, N. Y. 8 x 11 in. 248 pp. $3.00.

The latest edition of this buyer's guide, which is intended as an aid to buyers of merchandise in the selection of properly designed and engineered plastics products and as a specific guide to sources of supply for such products, has been revised and brought completely up-to-date. It includes a nontechnical discussion of plastics materials, treating with their advantages and limitation, as well as a complete list of consumer products made entirely or largely of plastics, together with the names and addresses of companies making them. As indicated above, this directory is invaluable to retail and wholesale buyers of plastics consumer products.

•

Organic Nitrogen Compounds. Carbide & Carbon Chemicals Corp., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in. 36 pp.

This booklet presents the latest data on more than thirty nitrogen compounds manufactured by the company. Detailed information is contained on the properties, specifications, and uses of the alkyl amines, alkylene amines, alkanolamines, and acetoacetarylamides. Their physical constants, comparative hygroscopicities, and neutralization curves are given in chart form. These compounds are used by various industries for many purposes such as emulsifying, neutralizing, synthesizing, dissolving, and saponifying.

•

Fiber Bonded Processes. Dan River Mills, Inc., Danville, Va., 8½ x 11 in. 36 pp.

The basic process developed by the company for treating yarns, threads, rovings, slivers, and the like with a bonding material is explained in this booklet. Divided into several compact sections, the booklet contains information on the process, the physical principles involved, the fiber bonded machines used, and various applications. Micro-photographs of cross-sections of the yarns or rovings before and after being treated by the bonding agent are reproduced. The patents under which the company is granting licenses together with the licensing agreement are presented verbatim.

•

The Theoretical Basis of Adhesion. By W. A. Weyl. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 50c.

This is a reprint of the paper on adhesion given by the author at a meeting of A. S. T. M. Committee D-14 on Adhesives held in Buffalo, N. Y., June 27, 1946. It is divided into four sections, as follows: (1) Problems of Adhesion in Glass Technology; (2) The Nature of Chemical Forces; (3) Methods of Studying Surface Forces; (4) Summary and Conclusions. The discussion following the original presentation of the paper is included in the reprint.

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Silicone News

DC

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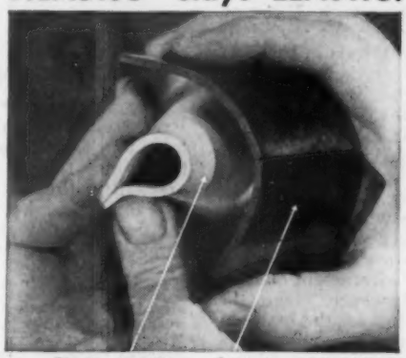

Silastic after 68 days at 300° F. | Synthetic organic rubber after 1 day at 300 °F.

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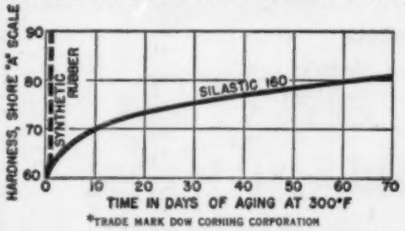
This column of new data will give you a better idea of how heat-stable Silastic really is. You may remember a previous column giving brittle points ranging from −70 to −100° F. for the same Silastic stocks. It's more than a slogan—Silastic stays elastic in oven heat or arctic cold.

Effect of Aging at 300° F.

Test Sample	Weight Loss, %	Shrinkage, %	Decrease in Elasticity, %
Silastic 160 after 61 days	2.8	2.6	12
Synthetic Rubber[1] after 1 day	8.6	3.5	75

[1] One of the most heat-stable synthetic organic rubbers.

The increase in the hardness of Silastic 160 compared with one of the most heat resistant of the synthetic organic rubbers is shown in the graph below. Silastic is described in leaflet No. V13-3.



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Diffusion Pump
Mold Release

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Low Temperature
Valve Lubricants
Stopcock
High Vacuum

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Antifoam A

RESINS
Electrical Insulating
Laminating
Protective Coatings

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Molding
Extruding
Coating
Laminating

*Trade Mark Dow Corning Corporation

MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, JUNE 10, 1947

Natural Rubber

The price of spot rubber on the Commodity Exchange has dropped sharply since our last report, but has firmed up within the past few days. Starting with 22.25c on May 12 it touched a low for the period of 16.50c on May 29 and closed today (June 10) at 17.25c. The futures market showed a similar trend, September delivery dropping from 18.75c on May 12 to 15.72c on May 22. It closed today at 16.25c. Both spot and futures in the outside market followed the same trend.

The sharp drop in price, which was contrary to predictions made when free trading was restored in the United States, was attributed by rubber growers to the American synthetic rubber policy. Government officials of the United States, however, claim the drop is due to speculation on the part of small traders in the Far East who overpurchased in the belief that prices would rise sharply and who have dumped their rubber in panic as the price rise, failed to materialize.

American rubber manufacturers are still pursuing a cautious policy on rubber purchases. Reports of production and shipments from the Far East encourage such policy. According to the Department of Commerce, net exports from the Far East for the first quarter of the current year totaled approximately 265,000 long tons. A considerable increase is expected in the second quarter. Today's quotations in the outside market, London and Singapore, follow:

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.17¼
June	.17¾
July-September	.17
October-December	.16⅞
Thick or Thin Latex Crepe:	
Spot	.28
June	.28
Thin Brown Crepe, No. 2	.14¾
Ambers, No. 3	.14¾
Flat Bark Crepe	.14¾

London Market

(Standard Smoked Sheets)

July-September	16.58 - 16.79
October-December	16.16 - 16.37
January-March	16.06 - 16.27

Singapore Market

(Standard Smoked Sheets)

June	15.53 - 15.64

Synthetic Rubber

(Dry Types)

Butaprene NL	.400 - .425
Butaprene NAA	.440 - .465
Butaprene NXM	.470 - .495
Chemigum 30 N4NS	.400 - .470
Chemigum 50 N4NS	.400 - .470
Chemigum N3	.450 - .520
Hycar OR-25	.400 - .425
Hycar OR-15	.470 - .495
Hycar OS-10	.400 - .425
Neoprene Type E	—— - .650
Neoprene Types CG and AC	—— - .500
Neoprene Types FR and KNR	—— - .750
Neoprene Type S	—— - .320
Neoprene Type NC	—— - .250
Perbunan 18	.390 - .415
Perbunan 26	.400 - .425
Perbunan 35	.470 - .495
Thiokol Type A	.370 - .470
Thiokol Type FA	.520 - .620
Thiokol Type ST	.750 - .850
Thiokol PR-1	.750 - .850

Scrap Rubber

The scrap rubber trade is almost stagnant. Prices on practically all grades of scrap have touched post-war lows, with even inner tube scrap falling off in price. Reclaimers are still loath to accept any synthetic scrap. The export market is the immediate hope of the dealers to break up the market's present sluggishness. Recent quotations follow:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$18.00
Beadless truck tires	ton	24.00
Mixed truck tires	ton	18.00
Beadless passenger tires	ton	24.00
No. 1 passenger peelings	ton	50.00
No. 1 truck peelings	ton	50.00
No. 2 passenger tubes	lb.	.07½
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06½
Mixed passenger tubes	lb.	.06¼
No. 2 truck tubes	lb.	.07¼
Red truck tubes	lb.	.07
Black truck tubes	lb.	.07
Buffings	ton	18.00

Cotton Tire Fabrics

Standard, Peeler, 12/4/2	lb.	.7400
Standard, Peeler, 14/4/2	lb.	.7600
Standard, Peeler, 16/4/3	lb.	.7850
Extra Staple, Peeler, 12/4/	lb.	.8375
Extra Staple, Peeler, 14/4/2	lb.	.8575
Extra Staple, Peeler, 16/4/3	lb.	.8825

Chafers

14.4 oz. (per sq. yard)	lb.	.7150
9.25 oz. (per sq. yard)	lb.	.7450
11.65 oz. (per sq. yard)	lb.	.6450
8.9 oz. (per sq. yard)	lb.	.6900

Cotton

The price of middling uplands on the Cotton Exchange has swung in the range of 165 points since our last report (May 9), high for the period being 37.89 on June 10 and low 36.24 on May 13. The average price of middling uplands for the month of May was 36.71, based on 25 trading days. Prices of cotton for the last three weeks in May showed small net losses but failed to establish any definite trend, fluctuating irregularly between the high of 37.19 and low of 36.24 set during the first three days of the period. Despite the report by the Department of Agriculture at the end of May that mid-May parity for cotton declined 12 points from the previous month to 28.40 cents a pound, prices turned stronger in June and reached a high for the year of 37.89 on June 10. The strength in June has been attributed to reports that several important mills were not contemplating any early curtailment of operations, and that credit had been extended to China for the purchase of American cotton sufficient to cover her needs through August. Quotations for middling uplands on the Exchange follow:

	May 9	June 10		
	Close	High	Low	Close
July	34.62	35.70	35.42	35.67
October	29.60	30.87	30.55	30.86
December	28.59	29.80	29.45	29.77

Reclaimed Rubber

Tires		
Black, Acid	lb.	.08¼ @ .09¼
Black, Digester	lb.	.08 @ .08½
Peels	lb.	.09 @ .09½
GR-S Whole Tire	lb.	.08½ @ .09
Inner Tubes		
Black	lb.	.12¾ @ .13¾
Red	lb.	.13½ @ .14
GR-S	lb.	.09½ @ .10
Butyl	lb.	.08½ @ .09
Shoe		
Unwashed	lb.	.08¼ @ .08¾

Closing Rubber Prices on New York Commodity Exchange

No. 1 Standard Contract of 10 Tons

FROM MAY 10 TO JUNE 10

Date	Spot	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sales
May														
10	——	——	——	——	——	——	——	——	——	——	——	——	——	——
11	——	——	——	——	——	——	——	——	——	——	——	——	——	——
12	22.25	18.75	18.60	18.45	18.25	18.10	17.95	17.80	17.70	17.60	17.45	17.30	——	39
13	21.75	18.15	18.15	18.05	17.85	17.85	17.70	17.55	17.45	17.35	17.20	17.05	——	64
14	22.00	18.50	18.35	18.20	18.05	17.95	17.80	17.70	17.60	17.50	17.35	17.20	——	82
15	21.75	18.25	18.20	18.10	18.00	17.90	17.75	17.60	17.50	17.40	17.25	17.10	——	14
16	21.50	17.75	17.65	17.55	17.40	17.30	17.15	17.00	16.90	16.80	16.65	16.50	——	28
17	——	——	——	——	——	——	——	——	——	——	——	——	——	——
18	——	——	——	——	——	——	——	——	——	——	——	——	——	——
19	21.00	17.45	17.30	17.20	17.10	16.90	16.75	16.60	16.50	16.40	16.25	16.10	——	42
20	21.00	16.05	15.95	15.85	15.70	15.55	15.40	15.20	15.10	15.00	14.85	14.70	——	106
21	21.00	16.28	16.13	16.00	15.88	15.75	15.55	15.40	15.30	15.20	15.10	15.00	——	69
22	20.75	15.72	15.55	15.40	15.25	15.10	15.00	14.90	14.80	14.70	14.60	14.50	——	73
23	18.50	15.80	15.65	15.50	15.30	15.15	15.00	14.85	14.75	14.65	14.55	14.45	——	47
24	——	——	——	——	——	——	——	——	——	——	——	——	——	——
25	——	——	——	——	——	——	——	——	——	——	——	——	——	——
26	18.50	15.85	15.80	15.75	15.65	15.65	15.65	15.65	15.62	15.60	15.65	15.70	——	155
27	18.00	16.45	16.35	16.25	16.20	16.10	16.00	15.95	15.97	15.99	15.94	15.90	——	49
28	17.00	16.05	16.04	16.02	16.00	15.97	15.93	15.90	15.85	15.80	15.75	15.70	15.65	50
29	16.50	15.80	15.77	15.73	15.70	15.65	15.60	15.55	15.47	15.40	15.35	15.30	15.25	18
30	——	——	——	——	——	——	——	——	——	——	——	——	——	——
31	——	——	——	——	——	——	——	——	——	——	——	——	——	——
June														
1	——	——	——	——	——	——	——	——	——	——	——	——	——	——
2	17.25	16.15	16.15	16.15	16.15	16.10	16.05	16.00	15.93	15.85	15.80	15.75	15.70	14
3	17.25	16.50	16.47	16.43	16.40	16.34	16.27	16.20	16.13	16.05	16.00	15.95	15.90	29
4	17.50	16.60	16.52	16.46	16.40	16.30	16.22	16.15	16.07	16.00	15.95	15.90	15.85	47
5	18.00	17.20	17.15	17.05	17.00	16.90	16.80	16.70	16.62	16.55	16.50	16.45	16.40	39
6	17.50	16.80	16.70	16.60	16.55	16.50	16.40	16.30	16.22	16.15	16.10	16.05	16.00	35
7	——	——	——	——	——	——	——	——	——	——	——	——	——	——
8	——	——	——	——	——	——	——	——	——	——	——	——	——	——
9	17.50	16.70	16.65	16.55	16.50	16.45	16.35	16.25	16.17	16.10	16.05	16.00	15.95	5
10	17.25	16.25	16.15	16.10	16.05	16.00	15.90	15.80	15.72	15.65	15.60	15.55	15.50	14

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CURRENT MARKET PRICES

Of Rubber Chemicals and Compounding Ingredients

JUNE 10, 1947

Prices are, in general, f.o.b. works.
Range of prices indicates grade or quantity variations.
All trade or brand names are set off in quotation marks.
Abbreviations: bbls., barrels; c.l., carlot; l.c.l., less than carlot; dlvd., delivered; t.c., tank cars; min., minimum; dms., drums; cyl., cylinder.
* East of Mississippi.

—The arrangement of this section follows closely the Chemical Section of the 1945 RUBBER RED BOOK to which readers are referred to determine the classification of any material or brand name.
—Although suppliers of every material were contacted for price information, only those materials are listed for which quotations have been furnished us. The quotations are not guaranteed and prospective purchasers should contact suppliers for confirmation before placing orders. Suppliers are requested to send us regularly current prices on all of their materials used in the rubber industry.
—All requests for information or listings should be sent to Market Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y.

ACCELERATORS

"A-1"	lb.	.34	-	.39
"A-10"	lb.	.40	-	.47
"A-19"	lb.	.52	-	.58
"A-32"	lb.	.59	-	.69
"A-77"	lb.	.42	-	.55
"A-100"	lb.	.42	-	.55
"Accelerator No. 8" (dlvd.)	lb.	——	-	.75
"Accelerator No. 49"	lb.	.40	-	.42
"Accelerator No. 89" (dlvd.)	lb.	——	-	1.20
"Accelerator No. 122" (dlvd.)	lb.	——	-	1.30
"Accelerator No. 552" (dlvd.)	lb.	——	-	1.63
"Accelerator No. 808" (dlvd.)	lb.	.59	-	.61
"Accelerator No. 833" (dlvd.)	lb.	1.13	-	1.15
"Acrin" (dlvd.)	lb.	——	-	.65
"Advan"	lb.	.52	-	.55
"Altax"	lb.	.35	-	.37
"Arazate"	lb.	——	-	1.53
"Beutene"	lb.	.59	-	.61
"B-J-F"	lb.	.34	-	.36
"Butasan"	lb.	——	-	1.10
"Butazate"	lb.	——	-	1.10
"Butyl Eight"	lb.	1.00	-	1.05
"Captax"	lb.	.27	-	.29
"C-P-B"	lb.	——	-	1.95
"Cumate"	lb.	——	-	1.60
"Cuprax"	lb.	.60	-	.62
"Dibenzo G-M-F"	lb.	——	-	1.50
Diorthotolylguanidine (dlvd.)	lb.	.44	-	.50
Diphenylguanidine (dlvd.)	lb.	.39	-	.45
"El-Sixty"	lb.	.39	-	.46
"Ethasan"	lb.	——	-	1.10
"Ethazate"	lb.	——	-	1.10
"Ethyl Thiurad"	lb.	——	-	1.25
"Ethyl Tuex"	lb.	——	-	1.25
Formaniline (dlvd.)	lb.	.36	-	.37
"G-M-F"	lb.	——	-	1.95
"Good-rite Erie"	lb.	.60	-	.62
"Guantal"	lb.	.43	-	.50
"Hepteen"	lb.	.42	-	.44
"Base"	lb.	1.80	-	1.85
"Ledate"	lb.	——	-	1.20
Mercaptobenzothiazole	lb.	.27	-	.29
Mercaptobenzothiazyl Disulfide	lb.	.35	-	.37
"Methasan"	lb.	——	-	1.20
"Methazate"	lb.	——	-	1.20
"Monex"	lb.	——	-	1.25
"Mono Thiurad"	lb.	——	-	1.25
"Morfex 33"	lb.	.60	-	.62
"2-MT" (dlvd.)	lb.	.58	-	.60
"Novac"	lb.	——	-	1.40
"A-13"	lb.	.65	-	.67
"O-X-A-F"	lb.	.38	-	.40
"Pentex"	lb.	.74	-	.77
"Flour"	lb.	.12¼	-	.12¾
"Phenex" (tons)	lb.	——	-	.49
"Pipazate"	lb.	——	-	1.53
"Pip-Pip"	lb.	——	-	1.63
"R-2 Crystals"	lb.	——	-	1.55
"Rotax"	lb.	.44	-	.46
"SA 52"	lb.	——	-	1.25
"SA 57"	lb.	——	-	1.20
"SA 62"	lb.	——	-	1.25
"SA 66"	lb.	——	-	1.60
"SA 67"	lb.	——	-	1.10
"SA 77"	lb.	——	-	1.10
"Safex"	lb.	——	-	1.15
"Santocure"	lb.	.53	-	.60
"Selenac"	lb.	——	-	1.60
"Selenac" (Ethyl, Methyl)	lb.	——	-	1.60
"Setsit-5"	lb.	.75	-	1.00
"SPDX-G" (tons)	lb.	——	-	.59
"Tellurac"	lb.	——	-	1.60
"Tepidone" (dlvd.)	lb.	——	-	.63
"Tetrone" (dlvd.)	lb.	——	-	1.25
"A" (dlvd.)	lb.	——	-	1.85
Thiocarbanilide (dlvd.)	lb.	——	-	.34
"Thiofide"	lb.	.35	-	.42
"Thionex" (dlvd.)	lb.	——	-	1.25
"Thiotax"	lb.	.27	-	.34
"Thiuram E" (and "M") (dlvd.)	lb.	——	-	1.25
"Trimene"	lb.	.54	-	.56
"Base"	lb.	1.03	-	1.06
Triphenylguanidine (dlvd.)	lb.	——	-	.50
"Tuads" (Ethyl, Methyl)	lb.	——	-	1.25
"Tuex"	lb.	——	-	1.25
"Ulto" (tons)	lb.	——	-	.99
"L"	lb.	——	-	1.04
"Ureka"	lb.	.55	-	.62
"Blend B"	lb.	.55	-	.62
"C"	lb.	.52	-	.59
"Vistanex" (dms.)	lb.	——	-	.42
"Vulcanex" (dlvd.)	lb.	——	-	.45
"Z-B-X"	lb.	——	-	2.45

ACCELERATORS (Cont'd)

"Zenite" (dlvd.)	lb.	.37	-	.39
"A" (dlvd.)	lb.	.42	-	.44
"B" (dlvd.)	lb.	.39	-	.41
"Zimate" ("Butyl," "Ethyl")	lb.	——	-	1.10
"Zimate, Methyl"	lb.	——	-	1.20

ACTIVATORS

Blue Lead, Sublimed (dlvd.)	lb.	.08½	-	.09
Fish Oil, Hydrogenated, Fatty Acid				
"Hydrofol Acid" (dlvd.)	lb.	.27¾	-	.31¼
"Hyfac S-52" (dlvd.)	lb.	.33½	-	.34½
"Neo-Fat H.F.O." (dlvd.)	lb.	.14⅜	-	.16⅜
"Stearex Beads" (dlvd.)	lb.	.14⅓	-	.15⅓
Lime, Hydrated				
"Arrowhead"	ton	16.00	-	19.50
"Sierra"	ton	16.00	-	19.50
Litharge				
"Eagle" (dlvd.)	lb.	.09¾	-	.10¾
"FBS" (dlvd.)	lb.	.17	-	.17½
Magnesium Oxide, Heavy				
"General Magnesite"	lb.	.06	-	.08
"Michigan No. 15"	lb.	.05	-	.05½
"Permanente"	lb.	.05	-	.06½
Magnesium Oxide, Light				
"Baker's" (Neoprene Grade)	lb.	——	-	.28
"General Magnesite" (Neoprene Grade)	lb.	——	-	.28
"General Magnesite" No. 101	lb.	——	-	.175
"General Magnesite" Standard	lb.	——	-	.22
"K & M"	lb.	——	-	.28
"Michigan No. 30"	lb.	——	-	.22½
"No. 40"	lb.	.25	-	.28
"Witco Extra Light"	lb.	.25	-	.27
Oleic Acid (dlvd.)	lb.	.31½	-	.34½
"Elaine O-18" (dlvd.)	lb.	.25½	-	.27¾
"L.C.P. Red Oil"	lb.	.31½	-	.33¾
"Red Oil" (20-24 Saponified) (dlvd.)	lb.	.25½	-	.27¾
Palm Oil Fatty Acid (c.l.)	lb.	——	-	.11
Potassium Oleate (drums)	lb.	——	-	.29½
Red Lead				
"Eagle" (dlvd.)	lb.	.10¾	-	.11¾
"No. 2 RM" (dlvd.)	lb.	.18½	-	.19
Sodium Laurate (drums)	lb.	——	-	.19
Sodium Oleate—Powder (drums)	lb.	——	-	.35
Paste (drums)	lb.	——	-	.20

ACTIVATORS (Cont'd)

Sodium Stearate—Powder (drums)	lb.	——	-	.35
USP Grade (drums)	lb.	——	-	.37
Stearic Acid, Single Pressed				
"S-24" (dlvd.)	lb.	.34	-	.35
"Stearex B" (dlvd.)	lb.	.37	-	.38
Stearic Acid, Double Pressed				
"Alba" (dlvd.)	lb.	.32¼	-	.34¼
"S-2-A" (dlvd.)	lb.	.29½	-	.32
"S-2-B" (dlvd.)	lb.	.29	-	.31½
Stearic Acid, Other				
"Hydrex" (c.l., dlvd.)	lb.	——	-	.14⅜
"Neo-Fat 1-60" (dlvd.)	lb.	——	-	.36½
"Neo-Fat 1-65" (dlvd.)	lb.	——	-	.38
"Stearite"	cwt.	36.00	-	38.00
White Lead Carbonate (dlvd.)	lb.	.16	-	.16¼
Zinc Laurate (c.l.)	lb.	——	-	.29
"Laurex"	lb.	.33	-	.34
Zinc Stearate	lb.	.29	-	.31
"Aquazinc"	lb.	.20	-	.35

Unclassified Activators

"Actifat" (dms.)	lb.	——	-	.18
"Acidex"	lb.	.19	-	.32
"Aero Ac 50"	lb.	.46	-	.52
"165"	lb.	.43	-	.45
"Barak" (dlvd.)	lb.	——	-	.60
"Bunac K-17"	lb.	.23	-	.25
"D-B-A"	lb.	——	-	1.95
"Delac J"	lb.	.55	-	.57
"P"	lb.	.45	-	.48
"Dibutylamine No. 117" (l.c.l., dms.)	lb.	——	-	.69
"Palmalene" (drums)	lb.	——	-	.15
"Polyac" (dlvd.)	lb.	——	-	1.40
"Ridacto" (drums)	lb.	.22	-	.24
"Snodotte" (dlvd.)	lb.	.29½	-	.30½
"SOAC" (min. 10 dms.)	cwt.	——	-	14.00
"Triamylamine No. 180" (l.c.l., drums)	lb.	——	-	1.01

ANTI-COAGULANTS

Anhydrous Ammonia (l.c.l.)	lb.	.02½	-	.02¾
"National" (cyl., dlvd.)	lb.	.16	-	.20
Aqua Ammonia (l.c.l., dms.)	lb.	——	-	.03
"M.B.M." (l.c.l.)	lb.	——	-	.35

ANTI-FOAMING AGENTS

"Aero Anti Foam H"	lb.	——	-	.12
"Regular"	lb.	——	-	.08⅓

ANTI-OXIDANTS

"Agerite Alba"	lb.	2.15	-	2.25
"Gel"	lb.	.55	-	.57
"Hipar"	lb.	.70	-	.72
"HP"	lb.	.58	-	.60
"Powder"	lb.	.43	-	.45
"Resin"	lb.	.52	-	.54
"Resin D"	lb.	.43	-	.45
"Stalite"	lb.	.43	-	.45
"White"	lb.	1.30	-	1.40
"Akroflex C" (dlvd.)	lb.	.58	-	.60
"Aminox"	lb.	.43	-	.45
"Antox" (dlvd.)	lb.	.54	-	.56
"Aranox"	lb.	——	-	2.15
Benzoquinone	lb.	1.50	-	1.75
"Betanox Special"	lb.	.61	-	.63
"B-L-E"	lb.	.43	-	.45
"Powder"	lb.	.61	-	.63
"B-X-A"	lb.	.43	-	.45
Carvacrol	lb.	——	-	.80
Chlorcarvacrol	lb.	——	-	2.00
"Flectol H"	lb.	.43	-	.50
"Flexamine"	lb.	.58	-	.60
Gallic Acid, Tech.	lb.	1.10	-	1.15
USP or NF	lb.	1.27	-	1.30
Hydroquinone	lb.	.90	-	.94
Monomethylparaminophenol sulfate	lb.	2.40	-	2.90
"Neozone Standard" (dlvd.)	lb.	.66	-	.68
"A" (dlvd.)	lb.	.43	-	.45
"C" (dlvd.)	lb.	.47	-	.49
"D" (dlvd.)	lb.	.43	-	.45
"D Distilled" (dlvd.)	lb.	.48	-	.50
"Oxynone"	lb.	1.15	-	1.22
"Parazone" (dlvd.)	lb.	——	-	.68
"PDA-8"	lb.	.40	-	.42
"10"	lb.	.46	-	.48
"11"	lb.	.86	-	.95
"14"	lb.	.60	-	.62
"Perflectol"	lb.	.58	-	.65
"Permalux" (dlvd.)	lb.	1.53	-	1.55
Pyrogallic Acid, Resublimed	lb.	2.60	-	2.65
USP Crystals	lb.	2.10	-	2.15

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ANTI-OXIDANTS (Cont'd)

Resorcin, Tech. (dlvd.)	lb.	——	.64
"Santoflex B"	lb.	.43	.50
"BX"	lb.	.57	.64
"Santovar-A"	lb.	1.30	1.37
"Santowhite"	lb.	1.40	1.52
"S.C.R." (tons)	lb.	——	.32
"Solux" (dlvd.)	lb.	1.48	1.50
"Stabilite" (tons)	lb.	——	.48
"Alba" (tons)	lb.	——	.69
"L" (tons)	lb.	——	.48
Tannic Acid, Tech.	lb.	.70	.79
"Thermoflex" (dlvd.)	lb.	1.48	1.50
"A" (dlvd.)	lb.	.70	.72
"C" (dlvd.)	lb.	.54	.56
Thymol	lb.	——	2.50
"V-G-B"	lb.	.43	.45

ANTI-SCORCHING AGENTS

"Good-rite Vultrol"	lb.	.50	.55
"Retarder W" (dlvd.)	lb.	——	.36
Salicylic Acid, Tech.	lb.	——	.33
"Sodium Acetate 60-62% Crystals"	lb.	——	.05½

ANTISEPTICS AND GERMICIDES

Formaldehyde (barrels)	lb.	——	.0695
"G-4"	lb.	.95	2.50
"G-11"	lb.	3.50	5.50
Methyl Para Hydroxy Benzoate	lb.	——	1.25
Ortho Cresol (26°-27°)	lb.	——	.18
"Soligen Drier"—Copper 8% (drums)	lb.	——	.21
"Zinc 8%" (dms.)	lb.	——	.19¾

AROMATICS (DEODORANTS)

"Arolene 1980" (c.l.)	lb.	——	.10
"2286"	lb.	——	.25
"2553" (c.l., dms.)	lb.	——	.13
"Bouquet 149"	lb.	——	3.00
Coumarin	lb.	2.75	2.90
"Curodex 19"	lb.	——	4.75
"188"	lb.	——	5.75
"198"	lb.	——	6.75
"D-6 Masking Perfume"	lb.	——	1.35
"Deodorant 63"	lb.	——	1.00
"Deodorant L-37"	lb.	2.00	2.40
"L-44"	lb.	2.50	2.90
"N.L.T.X."	lb.	1.85	2.15
"Latex Perfume 5"	lb.	——	3.25
"6"	lb.	——	7.50
"9"	lb.	——	.65
"Neutroleum Delta"	lb.	——	2.40
"Gamma"	lb.	——	3.40
"Parador A"	lb.	2.00	2.50
"B"	lb.	.65	1.00
"C"	lb.	2.75	3.25
"D"	lb.	1.50	2.00
"E"	lb.	.25	.55
"Perfume Oil Bouquet Vanilla M"	lb.	2.40	2.75
"Rodo No. 0"	lb.	4.00	4.50
"No. 10"	lb.	5.00	5.50
"Rubbarome" (dms.)	lb.	1.10	2.10
"Rubber Perfume 7"	lb.	——	9.15
"12"	lb.	——	1.90
"Russian Leather 7"	lb.	——	4.10
Vanillin	lb.	2.35	2.40

BLOWING AGENTS

Ammonium Bicarbonate (dlvd.)	lb.	.06¾	.09¾
"Blowing Agent No. 15"	lb.	——	.35
Sodium Bicarbonate, Tech. (c.l., bags)	cwt.	——	1.85
"Sponge Paste"	lb.	——	.20
"Unicel" (dlvd.)	lb.	——	.60
"ND" (dlvd.)	lb.	——	1.00
Urea	ton	73.00	90.00

BONDING AGENTS

"Durez 12987"	lb.	.48	.53
"Interlake Resin No. 4162"	lb.	——	1.50
"MDI"	lb.	7.25	7.75
"50"	lb.	3.60	3.85
"Reanite"	gal.	6.75	7.25
"Rex Compound 482"	gal.	——	1.05
"Ty-Ply Q" (and "S")	gal.	6.75	9.00

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	——	6.75
Glacial—99½% (bbls.)	cwt.	——	11.30
Calcium Nitrate, Tech, Crystals	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	.059	.084
Zinc Nitrate, Tech.	lb.	——	.21½

COLORING AGENTS

Black

Carbon Black—See *Reinforcing Agents*			
"Lampblack No. 10"	lb.	.06	.09
"Mapico Black Iron Oxide" (50 lb. bags)	lb.	.0925	.095
"Raven Black Pure Iron Oxide"	cwt.	9.25	9.50

Blue

"Blue GD, Dispersed" (dlvd.)	lb.	——	3.95
"Paste" (dlvd.)	lb.	——	1.64
"Blue N" (dlvd.)	lb.	——	.945
"Blue YD, Dispersed" (dlvd.)	lb.	——	2.50
"Milori Blue 11840" (dlvd.)	lb.	——	.42
"Monastral Fast Blue CP" (dlvd.)	lb.	——	3.85
"PCD, Dispersed" (dlvd.)	lb.	——	2.50

Blue (Cont'd)

"Ramapo Blue"	lb.	3.40	3.45
"Rubber Blue X-1999"	lb.	——	1.00
"Stan-Tone Blue"	lb.	1.40	4.40
Ultramarine	lb.	.12	.30
"Victoria Blue BP-262-D"	lb.	2.25	2.30

Brown

Brown Iron Oxide	lb.	——	.10
"Mapico Brown" (50 lb. bags)	lb.	——	.12

Green

Green Chromium Oxide, Pure	cwt.	29.50	36.50
Green Chromium Oxide, Pure, Hydrated	cwt.	70.00	85.00
"Green FD, Dispersed" (dlvd.)	lb.	——	1.50
"Monastral Fast Green GSD, Dispersed" (dlvd.)	lb.	——	3.20
"GSD Paste" (dlvd.)	lb.	——	1.10
"Permansa Green CP-594"	lb.	——	1.35
"Pigment Green B"	lb.	——	1.50
"GL-652D"	lb.	.88	.93
"Ramapo Green"	lb.	4.00	4.05
"Rubber Green X-1292"	lb.	——	1.00
"Stan-Tone Green"	lb.	1.60	3.60
"Utility Green"	lb.	——	.30

Orange

"Molybdate Orange"	lb.	.39	.45
"Orange F" (dlvd.)	lb.	——	3.35
"FD, Dispersed" (dlvd.)	lb.	——	2.50
"Rubber Orange X-2065"	lb.	——	2.60
"Stan-Tone Orange"	lb.	——	2.20

Purple

Purple Oxide	lb.	——	.08

Red

Barium Lithol Red	lb.	.60	.70
Cadmium Red	lb.	.95	1.25
"Cadmolith Red" (bbls.)	lb.	1.10	1.35
Calcium Lithol Red	lb.	.60	.70
"Graphic Red" (dlvd.)	lb.	——	.70
Indian Red, Pure	cwt.	9.10	10.25
"Jozite"	lb.	.08¼	.08¾
"Mapico Red 297" (50 lb. bags)	lb.	.10	.10¼
"Oximony" Iron Oxide	lb.	——	.09
Red Iron Oxide, Light	cwt.	9.60	10.75
"Red PB" (dlvd.)	lb.	——	1.80
"PBD, Dispersed" (dlvd.)	lb.	——	1.65
"2B" (dlvd.)	lb.	——	1.65
"2BD, Dispersed" (dlvd.)	lb.	——	1.50
"Rubanox Red" CP-762 (dlvd.)	lb.	——	1.30
"Rubber Red CP-339" (dlvd.)	lb.	——	1.05
"Rubber Red X-1148"	lb.	——	.70
"Solfast Red CP-663" (dlvd.)	lb.	——	1.80
"CP-787" (dlvd.)	lb.	——	1.30
"Stan-Tone Red"	lb.	1.10	2.20
"Watchung Red"	lb.	1.80	1.85

White—Lithopone

"Albalith"	lb.	.05½	.05¾
"Astrolith"	lb.	.055	.0578
"Cryptone No. 19"	lb.	.07	.07¼
"CB No. 21"	lb.	.07	.07¼
"Permalith"	lb.	.04¼	.04½
"Ponolith"	lb.	.05½	.05⅞
"Sunolith"	lb.	.055	.0578

White—Titanium Pigments

"Rayox"	lb.	.15½	.18⅝
"Ti-Cal"	lb.	.06¼	.06¾
"Ti-Pure"	lb.	.16½	.19½
"Titanox A"—all grades (dlvd.)	lb.	.14½	.15¼
"B-30" (dlvd.)	lb.	.05¾	.06
"C" (dlvd.)	lb.	.05½	.05¾
"RA"—all grades (dlvd.)	lb.	.15½	.16¼
"RC-HT" (dlvd.)	lb.	.05½	.05¼
"Zopaque"	lb.	.16½	.17¼

White—Zinc Oxide (American Process)

"AZO-ZZZ 11" (and "22, 33, 44, 55")	lb.	.09½	.09¾
"Eagle"	lb.	.09	.09⅜
"Horse Head Special"	lb.	.09½	.09¾
"XX Red"	lb.	.09½	.09¾
"St. Joe Black Label"	lb.	.09½	.09¾
"Green Label"	lb.	.09½	.09¾
"Red Label"	lb.	.09½	.09¾

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	.12

White—Zinc Oxide (French Process)

"AZO-ZZZ 66"	lb.	.11¾	.12½
"Florence Green Seal"	lb.	.11¼	.11½
"Red Seal"	lb.	.10¾	.11
"White Seal"	lb.	.11¾	.12
"Kadox 72"	lb.	.09½	.09¾
"Black Label"	lb.	.09½	.09¾
"Red Label"	lb.	.09½	.09¾
"U. S. P. 12"	lb.	.12¾	.13

White—Zinc Sulfide

"Cryptone ZS-800"	lb.	.10	.10¾

Yellow

"Anchor Brand Pure Iron Oxide"	cwt.	7.75	8.00
Chrome Yellow	lb.	——	.26
Chrome Yellow (bags)	lb.	.07¾	.08
"Chrome Yellow 12310"	lb.	——	.18
"Ferrox"	cwt.	7.50	8.50

Yellow (Cont'd)

"Mapico Yellow" (50 lb. bags)	lb.	.07¾	.08
"Rubber Yellow X-1940"	lb.	——	1.60
"Stan-Tone Yellow"	lb.	1.20	1.75
Toluidine Yellow	lb.	1.60	1.65
"YL-556-D"	lb.	.75	.80
bags)	lb.	.0685	.071
"Oximony" Iron Oxide	lb.	——	.06¾
"Yellow G" (dlvd.)	lb.	——	1.95
"GD, Dispersed" (dlvd.)	lb.	——	1.65
"HN" (dlvd.)	lb.	——	1.48
Zinc Yellow	lb.	.19	.24

DISPERSING AGENTS

"Agchem SA-19"	lb.	——	.30
"SA-20"	lb.	——	.70
"Aquasol-AR 90%"	lb.	——	.14½
"Beaconol 52"	lb.	.60	.75
"Darvan No. 1" (and No. 2")	lb.	.19	.40
"Dilex"	lb.	——	.32
"Dispersaid"	lb.	1.25	1.35
"Halloid"	lb.	.03¾	.09½
"HornKem No. 1"	gal.	——	1.60
"No. 3G"	gal.	——	1.75
"No. 12"	lb.	——	.17
"Marasperse CB"	lb.	.10½	.18
"N"	lb.	.09	.10
"Ramol PW"	lb.	.18	.19
"Rubbex"	lb.	——	.25½
"Stan-Chem BQC"	lb.	.12¼	.17¾
"1067"	lb.	——	.13½
"1471"	lb.	.1687	.2187
"2251"	lb.	.12¼	.17¾
Triethanolamine (drums dlvd.)	lb.	.19	.20
"Triton R-400"	lb.	.15½	.25
"Yelkin TT"	lb.	.36¾	.45¾
"Zinsper"	lb.	——	.15

EXTENDERS

"Advagum 1098"	lb.	——	.85
"Bunaweld Polymer No. 780"	lb.	——	.22
"No. 5514"	lb.	——	.30
"D-92" (and "D-93") (dms.)	lb.	——	.12
"Extender 600"	lb.	——	.208
"Multi-Plast MV 60 Emul."	gal.	.32	.37
"Naftolen MV 60 Emul."	gal.	.60	.65
"HV 60 Emul."	gal.		.80
"PR-162 Latex" (dms.)	gal.	1.00	1.60
"Synprolac"	lb.	——	.19
"Synprowax"	lb.	.16	.19
"Vistanex Polybutene"	lb.	——	.32

FILLERS (Inert and Reinforcing)

Abrasives			
"Carbonite"	lb.	.15	95
"Lionite"	lb.	.09¾	.90
Aluminum Hydrate	lb.	——	.17
Aluminum Silicate			
"Silical"	ton	37.00	55.00
"Marter White"	ton	20.50	30.00
Barium Carbonate (l.c.l.)	ton	77.00	85.00
Barytes			
No. 1 Floated, White	ton	30.10	41.55
No. 2 Floated, Unbleached	ton	28.10	38.95
"No. 22 Barytes" (c.l.)	ton	——	18.37
"Foam A"	ton	——	30.10
Bentonite (c.l.)	ton	——	11.00
"SPV Volclay" (c.l.)	ton	——	11.00
Blanc Fixe	ton	72.50	-120.00
Blanc Fixe	ton	60.00	-120.00
Calcium Carbonate			
"Atomite" (c.l.)	ton	——	30.00
"B.I. White No. 1" (c.l.)	ton	——	7.50
"Blue-Star XX"	ton	——	45.00
"B.I. White No. 1" (c.l.)	ton	——	7.00
"Calcene T"	ton	40.00	50.00
"Camelwhite"	ton	27.50	30.00
"Kalite"	ton	33.00	62.00
"Kalvan"	ton	105.00	-133.00
"Lesamite" (c.l.)	ton	——	27.50
"Lim-Cal" (c.l.)	ton	——	12.50
"Millical" (c.l.)	ton	——	22.00
"Sierracal"	ton	15.00	18.50
"Suspenso" (c. l.)	ton	——	18.00
"Swansdown" (c.l.)	ton	——	18.00
"Witcarb R" (c.l.)	ton	——	-105.00
"R-12" (c.l.)	ton	40.00	60.00
Calcium Silicate			
"Silene EF"	ton	110.00	-120.00
Calcium Sulfate, Anhydrous			
"Snow White Filler"	ton	——	17.00
Calcium Sulfate, Hydrous			
"Crysta-Cal" (c.l.)	ton	——	12.50
"Terra Alba No. 1"	ton	12.00	14.40
Chalk Whiting (l.c.l.)	lb.	.0150	.0175
"Recco Paris Whiting"	ton	——	25.00
Clay			
"Alsite" (c.l.)	ton	——	13.00
"Aluminum Flake"	ton	15.50	60.00
"A.S.P. No. 1" (c.l.)	ton	——	30.00
"No. 11" (c.l.)	ton	——	40.00
"Buca" (c.l.)	ton	——	44.00
"Catalpo" (c.l.)	ton	——	33.00
"Champion"	ton	——	13.00
"C.S.D." (c.l.)	ton	——	12.00
"Crown"	ton	——	13.00
"Dixie"	ton	13.00	27.70
"Hydratex R"	ton	28.00	40.00
"Kaolloid Clay" (c.l.)	ton	——	10.50
"Markham" (c.l.)	ton	——	13.00
"McNamee"	ton	12.50	27.20
"Oldham"	ton	——	13.00
"Paragon"	ton	12.50	27.20
"Recco" (c.l.)	ton	——	13.00

COLORS for RUBBER

Red Iron Oxides
Green Chromium Oxides
Green Chromium Hydroxides

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Reinforcing Fillers
and Inerts

C. K. WILLIAMS & CO.

EASTON, PA.

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WATERGROUND WHITE and BIOTITE MICAS — Used for over 35 years in the Rubber Industry

The English Mica Co.
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PRESIDENT:
Dr. Firmo Ribeiro Dutra

DIRECTORS:
Dr. Otavio Augusto de Bastos Meira Sr. Francisco de Paula Valente Pinheiro, Sr. Francisco Vieira de Alencar.

AGENCIES:
Manaus, Cuiaba, Rio Branco, Porto Velho, Salvador (Bahia), Altamira, Benjamin-Constant, Boca do Acre, Guajara-Mirim, Rio de Janeiro, Sao Paulo and Belo Horizonte.

STATEMENT 31/12/1946

Capital paid up	CR$150,000,000.00
Reserves	23,717,561.70
Deposits & Current Accounts	33,763,294.70
	CR$207,480,856.40

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BANCO DE CREDITO DA BORRACHA S.A.
(Joint Stock Co.)

Praca Visconde do Rio Branco 4
Belém, Pará - Brasil

ESTABLISHED 1942

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ROSIN OIL
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GALEX a non-oxidizing RESIN
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for RED RUBBER

• ATTRACTIVE
• NON-DETERIORATING

RARE METAL PRODUCTS CO.
ATGLEN, PA.

FILLERS (Cont'd)

"Stellar-R"	ton	——	-	50.00
"Suprex"	ton	13.00	-	27.70
"Upton"	ton	19.50	-	21.00
"Whitetex" (c.l.)	ton	——	-	50.00
"Witco No. 1" (c.l.)	ton	13.00	-	33.00
"No. 2" (c.l.)	ton	13.00	-	33.00
Diatomaceous Earth	ton	30.00	-	50.00
"Kaylorite" (c.l.)	ton	——	-	30.00
Dolomite (c.l.)	ton	11.00	-	12.00
Flock				
Cotton	lb.	.08½	-	.20
"Filfloc F 40-9000"	lb.	——	-	.16
"Filfloc F 6000"	lb.	——	-	.22
Rayon, bleached or dyed	lb.	.85	-	1.50
Rayon, grey	lb.	——	-	.18
"Solka-Floc" (l.c.l.)	lb.	.05	-	.12
Wool, bleached or dyed	lb.	.70	-	1.00
Glue, Bone (dlvd.)	lb.	.16½	-	.18½
Ground Glass (l.c.l.)	lb.	.04	-	.06
Leather, Shredded	lb.	.05	-	.17
Lignin	lb.	.03	-	.06
"Indulin"	lb.	——	-	.09
Limestone, Pulverized	ton	3.25	-	10.00
"Micro Velva"	ton	30.00	-	32.00
"Velvet Filler, Regular"	ton	16.00	-	18.00
Magnesium Carbonate	lb.	.07¼	-	.08¼
"Clearcarb"	lb.	.10	-	.10½
"K & M"	lb.	.07¼	-	.08¼
Magnesium Silicate	ton	18.00	-	35.00
"Airex"	ton	22.50	-	23.50
"Asbestol"	ton	17.00	-	25.00
"Blue Star Talc"	ton	——	-	21.00
"L.S. Silver"	ton	24.50	-	26.50
"Sierra White"	ton	20.75	-	22.75
Mica	lb.	.03	-	.07
"Concord"	lb.	.06½	-	.06¾
"Micro-Mica"	lb.	.06½	-	.07
"Mineralite" (c.l.)	ton	30.00	-	40.00
"Silversheen"	lb.	.06¼	-	.06¾
"Triple A Mica" (c.l.)	ton	——	-	25.00
"Wet Ground Mica No. 160"	lb.	.05¼	-	.06¾
Mineral Black				
"Keystone 126"	ton	——	-	13.00
Pumice	lb.	.03	-	.05
Pyrophyllite				
"Pyrax A" (c.l.)	ton	——	-	11.50
"WA" (c.l.)	ton	——	-	13.00
Silica	ton	16.00	-	27.00
"Blue Star"	ton	——	-	21.50
Slate, Powdered (l.c.l.)	ton	15.00	-	20.00
Talc, Domestic	ton	9.00	-	20.00
Walnut Shell Flour	ton	35.00	-	65.00
Whiting, Commercial	ton	8.00	-	20.00
"Cameline" (c.l.)	ton	8.50	-	10.00
"C-C-O White"	ton	——	-	14.50
"Keystone" (c.l.)	ton	——	-	16.00
"Snowflake" (c.l.)	ton	——	-	18.00
"Veroc" (c.l.)	ton	——	-	8.50
"York White" (c.l.)	ton	——	-	9.00
Wood Flour	ton	20.00	-	62.18

FINISHING MATERIALS, SURFACE

"Beaco Finishes"	gal.	1.05	-	1.35
"Black Out"	gal.	4.50	-	8.00
Shellac, Orange Gum	lb.	.70	-	.80
"VanWax"	gal.	1.25	-	1.30

FLAME RETARDANTS

Chlorinated Paraffin	lb.	.10	-	.25
"Halowax"	lb.	.24	-	.30
"Zinc Borate 3167"	lb.	.12	-	.16¾
"Zyrox"	lb.	.35	-	.45

LUBRICANTS, MOLD

"Aquadag"	lb.	3.15	-	3.45
"Aquarex L Paste" (dlvd.)	lb.	——	-	.85
"MDL Paste" (dlvd.)	lb.	——	-	.32
Borax, Granular (l.c.l.)	ton	70.00	-	80.06
"Colite Concentrate" (dms.)	gal.	——	-	.90
"Concentrex"	lb.	——	-	.20
"Dipex"	lb.	.14	-	.18
"Dri-Lube"	lb.	——	-	.18
"Erlen Mold Lubricant"	gal.	1.00	-	1.25
"Glycerized Lubricant"	gal.	——	-	1.50
"Glydag"	lb.	1.30	-	2.00
"G.T.M.C. Solution"	lb.	1.05	-	1.35
"Kokobace"	lb.	——	-	.12
"Latex-Lube"	lb.	.22¼	-	.24¾
"Liqui-Lube"	lb.	.17¼	-	.18¾
"Lubrex"	lb.	.25	-	.30
"Migralube"	lb.	——	-	.30
"Moldex"	lb.	——	-	.12½
"Moldexe No. 1"	gal.	——	-	36.00
"No. 2"	gal.	——	-	10.00
"No. 3"	gal.	——	-	25.00
"Mold-Stick"	lb.	.202	-	.215
"Orvus WA Paste" (dms.)	lb.	——	-	.25
"Prodag"	lb.	.25	-	.38
"Redotex Flakes" (dlvd.)	lb.	.25¾	-	.26½
"Powder" (dlvd.)	lb.	.26⅜	-	.27
"Rubber-Flo"	gal.	——	-	1.15
"Rubber-Glo"	gal.	——	-	.94
"Rusco Mold Paste"	lb.	.12	-	.18
"Sericite" (l.c.l.)	ton	65.00	-	75.00
"Ulco Mold Soap"	lb.	.16	-	.29
"Werkrite Flakes" (dlvd.)	lb.	.18⅜	-	.19
"Powder" (dlvd.)	lb.	.19⅛	-	.19¾

LUBRICANTS, RUBBER

Lithium Stearate	lb.	.75	-	.77
Propylene Stearate (drums)	lb.	——	-	.40
"Rubberol"	lb.	——	-	.18½

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.55	-	.56
Calcium Stearate	lb.	.51	-	.53
"Orel"	gal.	1.85	-	2.00
Polyethylene Glycol	lb.	.25	-	.26

LUBRICANTS, RUBBER SURFACE (Cont'd)

"Rexanol A"	lb.	——	-	.11
"Separex A"	lb.	——	-	.15
Zinc Stearate	lb.	.54	-	.55

MOLD CLEANERS

"Actusol"	gal.	1.65	-	1.85
"Metso 99"	cwt.	3.05	-	4.45
"Granular"	cwt.	2.50	-	3.55
"Rubber-Sol"	gal.	——	-	1.89
"Shelblast"	ton	80.00	-	140.00
Sodium Silicate	cwt.	.80	-	1.40
"Sprex A.C."	lb.	——	-	.15

PEPTIZING AGENTS

Carbothermic Magnesia	lb.	——	-	.13½
"Peptizer P-12"	lb.	.84	-	.90

PLASTICIZERS & SOFTENERS

"AA" (drums)	lb.	——	-	.13¾
"Acto 500"	lb.	——	-	.09
"Adipol BCA" (dms.)	lb.	.43½	-	.44
"Amalgamator Z-4"	lb.	——	-	.30
"American" Pine Tar	gal.	.30½	-	.38½
"Bardex"	lb.	.05	-	.05¼
"Bardol"	lb.	.02¼	-	.03
"B"	lb.	.05	-	.05½
"Bayol D"	gal.	.29½	-	.31½
"F"	gal.	.46	-	.49
Beeswax, Refined & Bleached	lb.	.64	-	.74
Yellow Refined	lb.	.63½	-	.68
"Bondogen"	lb.	.55	-	.85
"B.R.C. No. 20"	lb.	.0105	-	.0115
"B.R.H. 2"	lb.	.0225	-	.0235
"BRS 700"	lb.	.012	-	.018
"B.R.T. 3"	lb.	.019	-	.02
"4"	lb.	.02	-	.021
"7"	lb.	.0215	-	.0225
"B.R.V."	lb.	.03	-	.0375
"Bunarex"	lb.	.05½	-	.06½
"Bunatak M"	lb.	——	-	.20
"O"	lb.	——	-	.18
"R"	lb.	——	-	.14
"U"	lb.	——	-	.15
"No. 21"	lb.	——	-	.08
"No. 90"	lb.	——	-	.08
"No. 865"	lb.	——	-	.17
"No. 1080"	lb.	——	-	.09½
Burgundy Pitch	lb.	.1051	-	.1115
"Butac"	lb.	.1275	-	.1650
Butyl Benzyl Sebacate	lb.	.75	-	.77½
Butyl Palmitate	lb.	——	-	.26⅜
Butyl Roleate	lb.	.16	-	.18
"BWH-1"	lb.	——	-	.11
"Campol" (t.c.)	ton	——	-	42.00
Candelilla Wax, Prime	lb.	.78	-	.85
"Carbonex"	lb.	.03	-	.03½
"S" Flakes	lb.	.04½	-	.05
"S" Plastic	lb.	.0435	-	.046
"Carbowax 4000" (drums)	lb.	.29	-	.30
"Cardolite 615"	lb.	.37	-	.40
"816"	lb.	.25½	-	.28½
"5858"	lb.	.42	-	.46
Carnauba Wax, Crude	lb.	1.30	-	1.35
Refined	lb.	1.40	-	1.45
Substitute	lb.	.45	-	1.08
Yellow	lb.	1.75	-	1.80
"Celluflex 142" (and "179") (drums)	lb.	——	-	.31½
Ceresine Wax	lb.	.15	-	.20
"Contogum"	lb.	.06¾	-	.10¼
"Cumar Resins"	lb.	.05½	-	.14½
"Darex Copolymer X11"	lb.	.40	-	.50
"X54"	lb.	.42	-	.60
"D.B.M."	lb.	——	-	.30
Degras, Common	lb.	.10	-	.14
Diamylphenol (l.c.l., drums)	lb.	——	-	.21
Dibenzyl Ether (drums)	lb.	——	-	.40
Dibenzyl Sebacate	lb.	.66	-	.70½
Dibutyl Phthalate	lb.	.34½	-	.36½
Dibutyl Sebacate—Tech.	lb.	.49	-	.51½
C.P.	lb.	.51	-	.53½
Dicapryl Phthalate	lb.	.24½	-	.27
"Di-Carbitol Phthalate" (dms.)	lb.	.37½	-	.38
Dicyclohexyl Phthalate	lb.	——	-	.43
"Dielex"	lb.	.05½	-	.06
Diethyl Phthalate (t.c.)	lb.	.30	-	.32
Dihexyl Sebacate	lb.	.47	-	.49½
"Monoplex 5"	lb.	.98	-	1.00
Dimethyl Phthalate	lb.	.28	-	.30
Dimethyl Sebacate	lb.	.65	-	.67½
"Dinopol" (dms.)	lb.	.43½	-	.44
Dioctyl Phthalate (dms.)	lb.	.39½	-	.40
"Dipolymer Oil"	gal.	.33	-	.38
"Dispersing Oil No. 10"	lb.	.04½	-	.04¾
"Dutrex A" ("B," "5," "6")	lb.	.02½	-	.03¾
"15"	gal.	.10	-	.189
"20," "21," "25"	lb.	——	-	.03
"Dyal 89"	lb.	——	-	.45
"Econo-Plast" (drums)	lb.	.03¼	-	.03¾
"ELA" (dlvd.)	lb.	——	-	.80
"Estac"	lb.	——	-	.14½
"Ethox" (dms.)	lb.	.35½	-	.36
"Flexol DOP"	lb.	.379	-	.424
"TOF"	lb.	.45	-	.52
"3GH"	lb.	.55	-	.60
"3GO"	lb.	.515	-	.60
"4GO"	lb.	.40	-	.47
"H-70"	lb.	.56¾	-	.64½
"Hercolyn" (dlvd.)	lb.	.12	-	.16
"Herron-H.T."	gal.	.17	-	.23
"Herron-Plas"	lb.	——	-	.03½
"Herron-Wax"	lb.	——	-	.04½
"HT-300"	lb.	.45¾	-	.53
"Indonex 633½" ("634½, 638½, 639½")	gal.	.14	-	.16
"VG" (dlvd.)	lb.	——	-	.07

PLASTICIZERS & SOFTENERS (Cont'd)

"Indopol H-300" (bbls.)	gal.	1.28	-	1.32
"JMH"	lb.	——	-	.65
"Kapsol" (dms.)	lb.	.50½	-	.51
"KP 23" (dms.)	lb.	.48½	-	.49
"70" (dms.)	lb.	.39½	-	.40
"120" (dms.)	lb.	.59½	-	.60
"140" (dms.)	lb.	.49½	-	.50
"150" (dms.)	lb.	.41½	-	.42
"201" (dms.)	lb.	.40	-	.42
"Kronisol" (drums)	lb.	.35½	-	.36
"Kronitex" (drums)	lb.	.31½	-	.32
Lanolin, Tech., Anhydrous	lb.	.20	-	.26
Lead Oleate	lb.	.16½	-	.42
"Lindol" (drums)	lb.	——	-	.25½
2-Mercaptoethanol (drums)	lb.	——	-	.75
"Methox" (dms.)	lb.	.35½	-	.36
Methyl Oleate	lb.	——	-	.20
Methyl Stearate	lb.	——	-	.14
"Monoplex DOS"	lb.	.87½	-	.88½
"Montan Substitute No. 506"	lb.	.425	-	.435
Montan Wax, Crude	lb.	.50	-	.55
"Monten Wax" (c.l.)	lb.	.52	-	.55
"Monty Wax"	lb.	——	-	.35
"Multi-Plast" (drums)	lb.	.04½	-	.05
"Naftolen HV" (and "R-100") (drums)	lb.	.11	-	.12
"Natac"	lb.	.1275	-	.1650
"LV" and "MV" (drums)	lb.	.05¼	-	.05¾
"Nerium"	lb.	——	-	.09
"Nevillac Resins" (drums)	lb.	.23	-	.45
"Neville Resins" (drums)	lb.	.09	-	.14½
"Nevindene Resins" (drums)	lb.	.11½	-	.14½
"Nevinol" (drums)	lb.	——	-	.16
"Nevoll"	lb.	.03	-	.04
"Nevtex 10" (drums)	lb.	——	-	.08½
"Nuba 1" (and "2") (drums)	lb.	——	-	.03½
"3X" (drums)	lb.	——	-	.05
"15 (and 30) Oil" (drums)	lb.	——	-	.17¼
"781 Oil" (drums)	lb.	——	-	.22
"No. 480 Oil Proof Resin"	lb.	.14	-	.14½
"Opalwax"	lb.	——	-	.45
Ortho-Nitrobiphenyl	lb.	.06	-	.11
"Ozokerite Wax No. 64 White"	lb.	.31	-	.32
"Yellow"	lb.	.25	-	.26
"P-1" (and "4, 6, 8, 20")	lb.	.26½	-	.33
"P-75"	lb.	.66	-	.72
"Pale 4" (and "1000")	lb.	——	-	.17¾
Palm Oil	lb.	——	-	.11
"Paradene Resins" (drums)	lb.	.05½	-	.06½
"Para Flux" (drums)	gal.	——	-	.19
"2016" (l.c.l.)	gal.	——	-	.20
"Para Lube" (l.c.l.)	lb.	——	-	.048
"Paraplex G-25"	lb.	1.04½	-	1.05½
"G-40"	lb.	.48¾	-	.49¾
"Parmo"	lb.	.06	-	.13½
"Paroil 143"	lb.	——	-	.09¾
"170, Powdered"	lb.	——	-	.18
"Pentalene 90" (l.c.l., dms.)	lb.	——	-	.17
"92" (l.c.l., drums)	lb.	——	-	.25
"Pentaphen No. 114" (l.c.l., bags)	lb.	——	-	.23
"Pepton 22"	lb.	.70	-	.75
"PG-16" (drums)	lb.	——	-	.34
"Philplast No. 1"	gal.	.18	-	.35
"No. 2"	gal.	.13	-	.35
"Picco 10" (and "25")	lb.	——	-	.11
"75" (and "100")	lb.	——	-	.10½
"S.O.S."	gal.	.29	-	.34
"Piccocizer 30"	lb.	.05½	-	.06
"D"	lb.	——	-	.10
"Piccolastic A" (and "B, C, D, E")	lb.	.20	-	.20½
"F"	lb.	.12½	-	.13
"Piccolyte S Resins"	lb.	.17	-	.20½
"Piccoumaron Resins"	lb.	.07	-	.11
"Piccovar"	lb.	.11	-	.11½
"Piccovol"	lb.	.02	-	.02¾
"Pictar"	gal.	.18	-	.23
"Plas-Blend 360"	lb.	.02½	-	.03
"Plastac M"	lb.	——	-	.09½
"Plasticizer 3"	lb.	.12	-	.14
"Plasticizer No. 7-2"	lb.	——	-	.60
"No. 11-2"	lb.	——	-	.32
"Plasticizer No. 1889"	lb.	——	-	.565
"No. 1919"	lb.	——	-	.52
"No. 2069" (l.c.l.)	gal.	——	-	.23
"No. 2070" (l.c.l.)	gal.	——	-	.30
"Plasticizer ODN" (Tech.)	lb.	.30	-	.357
Purified	lb.	.36	-	.417
"Plasticizer SC"	lb.	——	-	.75
"Plasticizer VA-1"	lb.	.33	-	.35
"Plastoflex 50"	lb.	.36	-	.37
"J-21"	lb.	——	-	.41
"Plastogen"	lb.	.07¾	-	.12
"Plastolein X-55" (dms.)	lb.	——	-	.60
"X-148" (dms.)	lb.	——	-	.70
"Plastone"	lb.	.27	-	.30
"Polymel Liquid"	gal.	.12	-	.17
"Polymel Resins"	lb.	.02½	-	.05½
"PT 400" ("600," "800") (c.l., dms.)	gal.	.30½	-	.39½
"Refrigerator Oil 145-R"	gal.	——	-	1.25
"Reogen"	lb.	.11½	-	.16
"465 Resin" (drums)	lb.	——	-	.04½
"Resin 731"	lb.	——	-	.13¾
"Resin C"	lb.	.015	-	.021
"Resinex"	lb.	.02¾	-	.03¼
"L-4"	lb.	.01¾	-	.02½
"Ridbo 369" (drums)	lb.	.08	-	.09
"369-F" (drums)	lb.	——	-	.12
Rosin Oil	gal.	.54	-	1.20
"R.P.A. No. 2" (dlvd.)	lb.	——	-	.65
"No. 3"	lb.	——	-	.46
"No. 4" (dlvd.)	lb.	——	-	.80
"No. 5" (dlvd.)	lb.	——	-	.57

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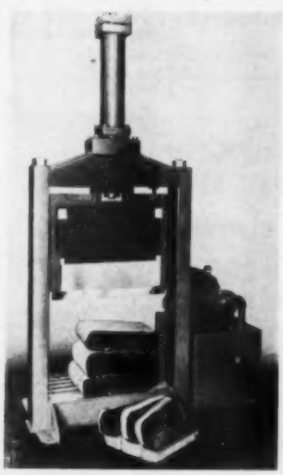

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PLASTICIZERS & SOFTENERS (Cont'd)

"R.S.O. Softening Oil"	lb.	.02½ -	.03
"Rubtar"	gal.	— -	.40
"Santicizer B-16"	lb.	.32 -	.36
"E-15"	lb.	.34 -	.38
"M-17"	lb.	.35½ -	.39
"No. 140"	lb.	.25 -	.35½
"Softener No. 20"	gal.	.09 -	.25
"S.P.C."	lb.	— -	.19½
"Stanolind Petrolatum"	lb.	.032 -	.069
"Wax"	lb.	.25 -	.30
"Staybelite Resin" (dms.)	lb.	— -	.11
"Sunny South" Pine Tar	gal.	.30½ -	.38½
"Superla Wax"	lb.	.23 -	.28
"Syncera Wax"	lb.	.16 -	.21
"Synplasticizer"	lb.	— -	.10
"Syn Tac" (c.l.)	gal.	— -	.33
"Synthol"	lb.	— -	.22½
Tar, Refined	gal.	.10 -	.15
"K-Tarnel NR" (t.c.)	lb.	— -	.0851
"Terpene A"	gal.	— -	.65
"TP-90B" (and "TP-95")	lb.	.65 -	.75
"TP-99	lb.	.60 -	.70
Triacetin	lb.	.34 -	.45
Tricresyl Prosphate	lb.	— -	.33½
"Turgum S"	lb.	.11½ -	.13
"Vanadiset A" (to "F")	lb.	.0165 -	.05
"Pulverized"	lb.	.08½ -	.21
"Solution"	gal.	.40 -	.65
"Vistac No. 1"	gal.	— -	1.32
"No. 2"	gal.	— -	1.66
"No. 4"	gal.	— -	1.80
"Wilcor-Plast"	lb.	.02½ -	.02¾
"Witresin"—Granular	ton	41.00 -	43.00
Solid	ton	36.00 -	38.00

PROCESSING AIDS

Castor Oil, Processed (dms.)	lb.	— -	.17¼
Refined (drums)	lb.	— -	.15¼
"Castorwax" (min. 400 lbs.)	lb.	— -	.25
"Dutrex 7"	lb.	.02½ -	.03¼
"30"	gal.	.24 -	.27
"ELA" (dlvd.)	lb.	— -	.80
"Resin No. 510"	lb.	— -	.16
"Wilmac D-X"	lb.	.15 -	.16½
"Zeton" (dms.)	lb.	— -	.32

PROTECTIVE & STABILIZING AGENTS

"Agchem SA-9" (to "SA-12")	lb.	.65 -	1.02
"Alpha Protein"	lb.	.28 -	.32
"Aroostocrat"	lb.	— -	.07½
Acacia	lb.	.12¾ -	.21
Carob Bean Flour	lb.	.42 -	.50
Casein	lb.	.33 -	.40
Ethylene Diamine 68%	lb.	.57 -	.58
Karaya Gum	lb.	.36 -	.45
"Prosein"	lb.	.071 -	.09
"Rex Compound No. 2801"	lb.	— -	.15
Sodium Alginate	lb.	— -	1.50
"Stablex B"	lb.	— -	.95
Tragacanth Flakes	lb.	.60 -	1.35

RECLAIMING AGENTS

"1-D Heavy Oil" (drums)	lb.	.04 -	.05
"No. 517 H.B. Oil"	gal.	.11½ -	.16½
"535"	gal.	.22 -	.27
"No. 523 H.S. Oil"	gal.	.22 -	.27
"C-6 Oil" (and "28," "32")	gal.	.33 -	.38
"C-10 Oil"	gal.	.21 -	.25
"C-33 Oil"	gal.	.19 -	.24
Caustic Soda—Flake 76% (c.l., drums)	cwt.	— -	2.90
Liquid 50% (t.c.)	cwt.	— -	2.00
Solid 76% (c.l., drums)	cwt.	2.50 -	2.75
Cresylic Acid (99-100%)	gal.	— -	.95
"D-4"	gal.	.19 -	.24
"E-5"	gal.	.17 -	.22
"LX-83 Reclaiming Solvent"	gal.	.13 -	.23
"LX-572 Reclaiming Oil"	gal.	.19 -	.28
"PT 101 Pine Tar Oil"	gal.	.30½ -	.39½
"PT 150 Solventine"	gal.	.60 -	.75
"Q Oil"	gal.	.206 -	.256
"Reclaiming Oil 1621"	lb.	.02 -	.02¾
"Reclaiming Reagent No. 3"	lb.	.12 -	.15
"Reclaiming Resin No. 1"	gal.	.15 -	.35
"R.P.A. No. 3" (dlvd.)	lb.	— -	.46
Soda Ash (c.l., bags)	cwt.	— -	1.20
"Solvent 534"	gal.	.22 -	.27
"Solvent Oil 21"	gal.	— -	.24
"Wilcor Reclaiming Oil No. 111" (drums)	gal.	.28 -	.32
"No. 151" (drums)	gal.	.28 -	.32
"X-1 Resinous Oil"	lb.	.0135 -	.02
"X-60 Solvent"	gal.	.20 -	.28

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

"Atlantic HPC-98"	lb.	.064 -	.102
"Continental F"	lb.	.0632 -	.1025
"Croflex"	lb.	.0632 -	.1025
"Crow"	lb.	.0632 -	.1025
"Dixiedensed" (and "S")	lb.	.0632 -	.1025
"Huber HX"	lb.	.0632 -	.1050
"Kosmobile" (and "S")	lb.	.0632 -	.1025
"Kosmos T"	lb.	.0632 -	.1025
"Micronex HPC"	lb.	.0632 -	.1025
"Spheron 4"	lb.	.0632 -	.102
"Witco Disperso No. 6"	lb.	.0632 -	.1025

Channel, Medium Processing (MPC) (bags)

"Atlantic MPC-95"	lb.	.064 -	.102
"Colloidal Micronex" (dms.)	lb.	.07¼ -	.08¼
"Continental A"	lb.	.0632 -	.1050
"Croflex TH"	lb.	.0632 -	.1025
"Dixie R-1"	lb.	.0632 -	.1025
"Dixiedensed HM" (and "S-66")	lb.	.0632 -	.1025
"Huber TX"	lb.	.0632 -	.1050
"Kosmobile HM" (and "S-66, SMG")	lb.	.0632 -	.1025
"Kosmos M"	lb.	.0632 -	.1025
"Micronex Standard"	lb.	.0632 -	.1025
"Spheron 6"	lb.	.0632 -	.102
"Witco Disperso No. 1"	lb.	.0632 -	.1025

Channel, Easy Processing (EPC) (bags)

"Atlantic EPC E-42"	lb.	.064 -	.102
"Collocarb"	lb.	— -	.065
"Continental AA"	lb.	.0632 -	.1025
"Croflex 77"	lb.	.0632 -	.1025
"Dixiedensed 77"	lb.	.0632 -	.1025
"Kosmobile 77"	lb.	.0632 -	.1025
"Micronex W-6"	lb.	.0632 -	.1025
"Spheron 9"	lb.	.0632 -	.102
"Witco Disperser No. 12"	lb.	.0632 -	.1025
"Wyex"	lb.	.0632 -	.105

Channel, Conductive (CC) (bags)

"Dixie 5"	lb.	.0740 -	.1175
"Kosmink"	lb.	.0740 -	.1175
"Spheron C"	lb.	.08 -	.12½
"I"	lb.	.066 -	.111
"N"	lb.	.18½ -	.25
"Voltex"	lb.	.15 -	.18½

Furnace, High Elongation (HEF) (bags)

"Sterling K"	lb.	.05 -	.09

Furnace, High Modulus (HMF) (bags)

"Continex HMF"	lb.	.05 -	.09
"Dixie 40"	lb.	.05 -	.09
"Kosmos 40"	lb.	.05 -	.09
"Modulex"	lb.	.05 -	.09
"Philblack A"	lb.	.05 -	.06
"Statex 93"	lb.	.05 -	.09
"Sterling L"	lb.	.05 -	.09

Furnace, Semi-Reinforcing (SRF) (bags)

"Colloidal Black Dispersion 33" (drums)	lb.	.12¾ -	.13¾
"Continex SRF"	lb.	.03½ -	.07½
"Dixie 20"	lb.	.03½ -	.07½
"Essex"	lb.	.03½ -	.07½
"Furnex"	lb.	.03½ -	.07½
"Gastex"	lb.	.03½ -	.07½
"Kosmos 20"	lb.	.03½ -	.07½
"Pelletex"	lb.	.03½ -	.07½
"Seminex"	lb.	.03½ -	.05½
"Sterling R"	lb.	.03½ -	.07½
"Sterling S"	lb.	.03½ -	.07½

Furnace, Fine (FF) (bags)

"Statex B"	lb.	.05¾ -	.09¾

Thermal, Fine (FT) (bags)

"P-33" (c.l.)	lb.	.05 -	.07¾

Thermal, Medium (MT) (bags)

"Thermax" (c.l.)	lb.	.03 -	.06

REINFORCING AGENTS—MISCELLANEOUS

"Darex Copolymer No. 3"	lb.	.39½ -	.42
"No. X34"	lb.	.45 -	.47½
"Darex Copolymer Latex No. 3 (and "X34")	lb.	.44½ -	.50
"Durez 12687" (and "12707")	lb.	.27½ -	.29
"Marbon B"	lb.	.65 -	.75
"S" and "S-1"	lb.	.41 -	.48
"Marmix"	gal.	1.35 -	1.75
"Naftex EPC"	lb.	.08¼ -	.11¼
"HMF"	lb.	.06⅝ -	.09
"MPC"	lb.	.08¼ -	.11¼
"SRF"	lb.	.05⅝ -	.07⅞
"Wilcorite R Resins"	lb.	.29 -	.35

RETARDERS

"E-S-E-N"	lb.	.34 -	.36
"Retardac 15A"	lb.	.15 -	.16½
"Retardex"	lb.	— -	.55

RUBBER SUBSTITUTES

Mineral Rubber

"38"	ton	26.00 -	32.50
"Black Diamond"	ton	26.00 -	27.50
"Byerlyte"	ton	36.00 -	50.00
Gilsonite, Selects (c.l.)	ton	33.50 -	34.50
"Hard Hydrocarbon" (dms.)	ton	32.00 -	34.00
"Herron Flake"	ton	40.00 -	42.00
Mineral Rubber, Granulated	ton	30.00 -	35.00
Solid	ton	27.00 -	32.00
"Parmr" (drums)	ton	26.00 -	30.00
"Pioneer"	ton	33.00 -	60.00

Vulcanized Vegetable Oils (Factice)

"Amberex"	lb.	.27 -	.38
Brown	lb.	.18 -	.38
Dispersed	lb.	.28 -	.49
"Neophax"	lb.	.20 -	.38
White	lb.	.13 -	.39

Miscellaneous Rubber Substitutes

"Gilsowax"	lb.	.04½ -	.05
"Insulac"	lb.	.06 -	.06½
"Resin No. 1098" (drums)	lb.	— -	.42
"No. 1198"	lb.	.31 -	.35
"Wilmex M-4" (and "M-6")	lb.	.05½ -	.06

SOLVENTS

Acetone (dlvd.)	lb.	.07 -	.09
"American" Dipentene (t.c.)	gal.	.60 -	.67
"Amsco" Lactol Spirits (t.c.)	gal.	— -	.13
"Rubber Solvent" (t.c.)	gal.	— -	.12½
"Solv A" (t.c.)	gal.	— -	.18
"Solv B" (t.c.)	gal.	— -	.19½
"Special Napthalite" (t.c.)	gal.	— -	.12½
"Textile Spirits" (t.c.)	gal.	— -	.13
Amyl Chlorides, Mixed (t.c.l.) (drums)	lb.	— -	.08
Benzol 90%	gal.	.17 -	.24
Butyl Acetate (t.c.)	lb.	— -	.198
Butyl Alcohol (t.c.)	lb.	— -	.206
Secondary (dlvd.)	lb.	.09½ -	.11½
Tertiary (dlvd.)	lb.	.11 -	.13
Carbon Bisulfide, Tech.	lb.	.05 -	.08
Carbon Tetrachloride	gal.	— -	.80
Cyclohexane	lb.	.09½ -	.13
Cyclohexanone	lb.	.25 -	.27 a
Diacetone, Pure (dlvd.)	lb.	.11½ -	.13½
Dichlorethyl Ether (drums)	lb.	.16 -	.17
Formal (drums)	lb.	.26 -	.27
Dichloropentane (t.c.l., (drums)	lb.	— -	.04½
"Dipentene 122" (dms.)	gal.	.68 -	.70
Ethyl Alcohol (t.c.)	gal.	.53½ -	.55½
Ethylene Dichloride (drums, dlvd.)	lb.	.08 -	.09
"Halowax Oil"	lb.	.27 -	.30
Heptanes (t.c.)	gal.	— -	.15
"Hexalin Cyclohexanol"	lb.	.20 -	.22 a
Hexanes (t.c.)	gal.	— -	.15⅜
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.40½ -	.53
Ether, Ref. (dlvd.)	lb.	.04½ -	.06½
Mesityl Oxide (dlvd.)	lb.	.11½ -	.13½
Methanol (dms., dlvd.)	gal.	.37 -	.44
Methyl Acetone, Syn. drums, dlvd.)	gal.	.46 -	.52
Methyl n-Amyl Ketone (drums)	lb.	.29 -	.30
Methyl Ethyl Ketone (dlvd.)	lb.	.09 -	.11
Methyl Isobutyl Ketone (dlvd.)	lb.	.12½ -	.14½
"N-5" Pentane Mix. (t.c.)	gal.	— -	.06½
"N-6" Hexanes (t.c.)	gal.	— -	.11¼
"N-7" Heptanes (t.c.)	gal.	— -	.10½
"Petrolene" (t.c.)	gal.	— -	.10⅛
Picolines, Alpha, Refined	lb.	.245 -	.25
Mixed	lb.	.24 -	.25
Pyridine, Refined	lb.	.55 -	.55½
Quinoline	lb.	.32 -	.32½
"Rubsol" (t.c.)	gal.	— -	.08625
"Skellysolve B" (Hexanes) (t.c.)	gal.	— -	.10½
"C" (Heptanes) (t.c.)	gal.	— -	.10
"E" (Octanes) (t.c.)	gal.	— -	.129
"R" (Solvent Naphtha) (t.c.)	gal.	— -	.081
"Solvenol"	gal.	.54 -	.63
Solvent, Crude, Light	gal.	.19 -	.28
"Sunny South" Dipentene	gal.	.60 -	.67
Toluene (drums)	gal.	— -	.28
Trichlorethane	lb.	.11 -	.12
Triglycol Dichloride (drums)	lb.	— -	.49
"Tromex"	lb.	.078 -	.083
"X-7" Sp. Heptanes (t.c.)	gal.	— -	.10
"X-8-A Solvent Naphtha"	gal.	— -	.07¾
Xylene (drums)	gal.	— -	.28

STABILIZING AGENTS (for Vinyl Resins)

"Dutch Boy DS-207"	lb.	— -	.52½
"Plumb-O-Sil A"	lb.	— -	.26
"Tribase"	lb.	— -	.22¼
Lead Stearate, Precip.	lb.	.55 -	.57
Fused	lb.	.60 -	.62
"Stabelan A"	lb.	.55 -	.65
"Stabilizer JCX"	lb.	— -	.45
"SN"	lb.	.36 -	.42
"V-1-N"	lb.	.44 -	.50
"V-9"	lb.	— -	.85
"Vanstay"	lb.	.38 -	.40

SUN CHECKING AGENTS

"Antisol"	lb.	.23 -	.24
"Heliozone" (dlvd.)	lb.	.23 -	.24
"Sunproof"	lb.	.23 -	.24
"Jr."	lb.	.17 -	.18
"Tonox"	lb.	.50 -	.52

TACKIFIERS

"Advaresin 100"	lb.	.14½ -	.15
"Agchem RC 30"	gal.	.65 -	1.34
"Amberol ST-137X"	lb.	.33 -	.33½
"Beckopol 1400"	lb.	.27 -	.28
"Dutrex 44"	gal.	— -	.919
"E-310 Resin Emulsion"	lb.	— -	.14
"Galex"	lb.	.13¼ -	.25
"Koresin"	lb.	.40 -	.52
"Lindol Emulsion" (drums)	lb.	— -	.27
"Liquid Rubber Flux"	lb.	— -	.125
"Nevilloid C-55" (drums)	lb.	— -	.12
"Pentacizer 344"	lb.	— -	.20
"Pentalyn Resins" (dlvd.)	lb.	.14¼ -	.21
"Resin V"	lb.	— -	.25¾
"Rubtack"	lb.	— -	.12
"Staybelite Esters" (dlvd.)	lb.	.15 -	.23¾
"Super-Beckacite No. 1001"	lb.	.37 -	.38
"Wilcorite R-30"	lb.	— -	.40

THICKENERS (FOR LATEX)

"Acrysol GS"	lb.	.14½ -	.22
"Betanol" (drums)	lb.	— -	.70
"Emulsorex No. 5"	lb.	— -	.35
Propylene Laurate (drums)	lb.	— -	.36
Sodium Silicate	lb.	.01 -	.02

VULCANIZING AGENTS

Selenium

"Vandex"	lb.	—	1.75

Sulfur

"Crystex" (l.c.l.)	lb.	.32	.35
"Dispersed Sulfur"	lb.	—	.09
"No. 2"	lb.	.08	.12
"Devil" (c.l.)	cwt.	—	1.35
"Insoluble Sulfur 60"	lb.	—	.16
"Star" (c.l.)	cwt.	—	1.85
"Tire"	cwt.	1.35	2.15
"Tube" (c.l., dlvd.)	cwt.	—	2.60

Tellurium

"Latex Telloy"	lb.	—	1.75
"Telloy"	lb.	—	1.75

Miscellaneous Vulcanizing Agents

"VA-3"	lb.	.55	.63
"Vultac No. 1"	lb.	.38	.45
"No. 2"	lb.	.38	.45
"No. 3"	lb.	.42	.49

WASHING & FINISHING AGENTS

"Apcolene" (t.c.)	gal.	—	.09⅜

WETTING AGENTS

"Advawet No. 15"	lb.	—	.18¼
"No. 33"	lb.	.40	.43
"Aerosol OT 70% Clear"	lb.	.80	1.00
"Agchem SA-15" ("16, 18")	lb.	.17	.29
"Alrosol" (dms.)	gal.	—	.48
"Aquarex BBX Conc." (dlvd.)	lb.	—	.78
"D" (dlvd.)	lb.	—	.75
"ME" (dlvd.)	lb.	—	.90
"NS" (dlvd.)	lb.	—	.90
"NS" (dlvd.)	lb.	—	.75
"Areskap 50"	lb.	.30	.38
"Dry 100"	lb.	.60	.72
"Aresket 240"	lb.	.30	.38
"Dry 300"	lb.	.60	.72
"Aresklene 375"	lb.	.42	.57
"Dry 400"	lb.	.70	.84
Lecithin	lb.	—	.26
"Santomerse D"	lb.	.43	.65
"S"	lb.	.13	.25
"Sorbit P"	lb.	—	.28
"Stablex G"	lb.	—	.70
"Triton K-60"	lb.	33½	.41
"N-100"	lb.	.59½	.67
"R-100"	lb.	.14½	.25
"720"	lb.	.30½	.38
"770"	lb.	.21¾	.29¼
"Vultamol"	lb.	—	.17½

MISCELLANEOUS CHEMICALS

"Acto 450" ("550-W," "600," "630")	lb.	.109	.145
"Agchem SA-17"	lb.	—	.29
"Aquarex SMO" (dlvd.)	lb.	—	.50
"A.S.T.M. Oil No. 1" (and "No. 3")	gal.	1.00	1.15
"Black Shield 4701"	lb.	—	.21
"Copper Inhibitor X-872-L"	lb.	—	1.50
2-Ethylhexanol (dms., dlvd.)	lb.	.25	.26
Glycerine, 88% Sap., Crude (dlvd.)	lb.	.33½	.34
"Hydrozo"	lb.	—	.51
"MODX" (tons)	lb.	—	.29½
"Para Resin No. 1784"	lb.	—	.09¾
"No. 2457" (c.l.)	lb.	—	.04
"No. 2718" (c.l.)	lb.	—	.04
"pHR"	lb.	—	1.25
"Resin No. 1226"	lb.	.31½	.36¼
Resorcinol (dlvd.)	lb.	—	.64
"Rio Resin"	lb.	.43	.45
"Santocel"	lb.	—	.50
"Sublac"	lb.	.39	.45
"Synpep N" (drums)	lb.	—	.54
"Thiokol LP-2"	lb.	—	.85
"LP-3"	lb.	—	.95
"Tysonite"	lb.	.21½	.22¼
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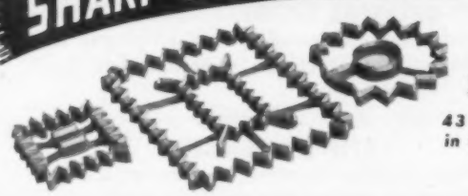

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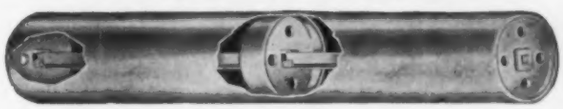

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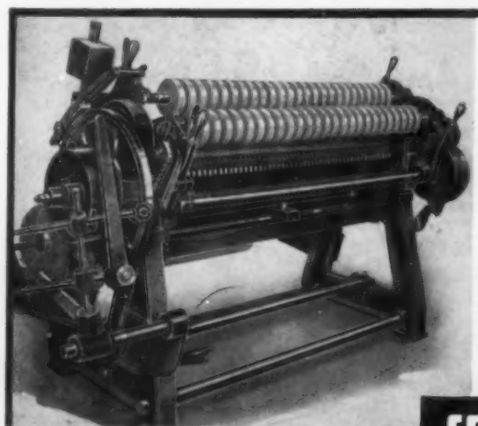

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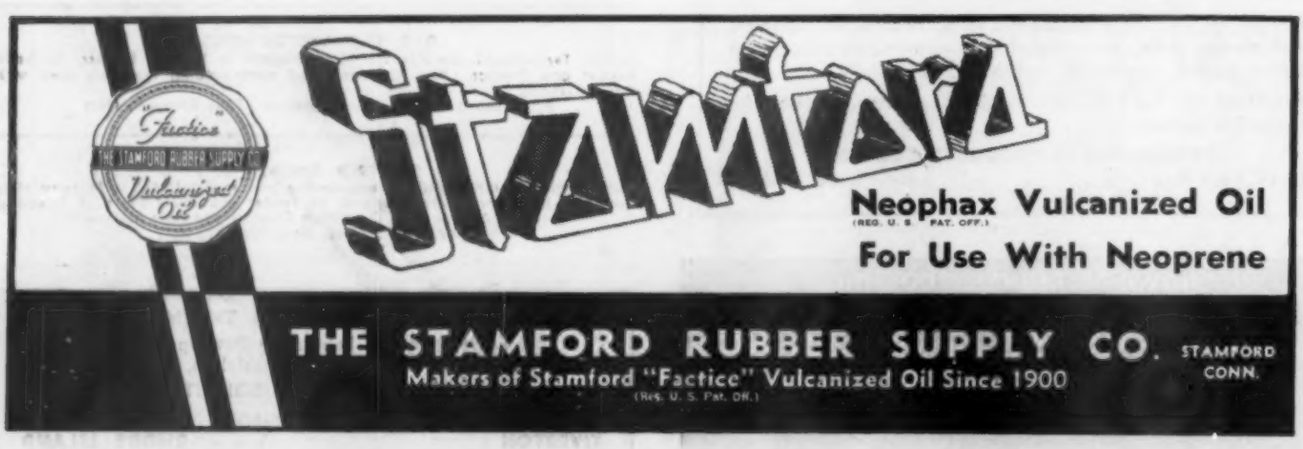

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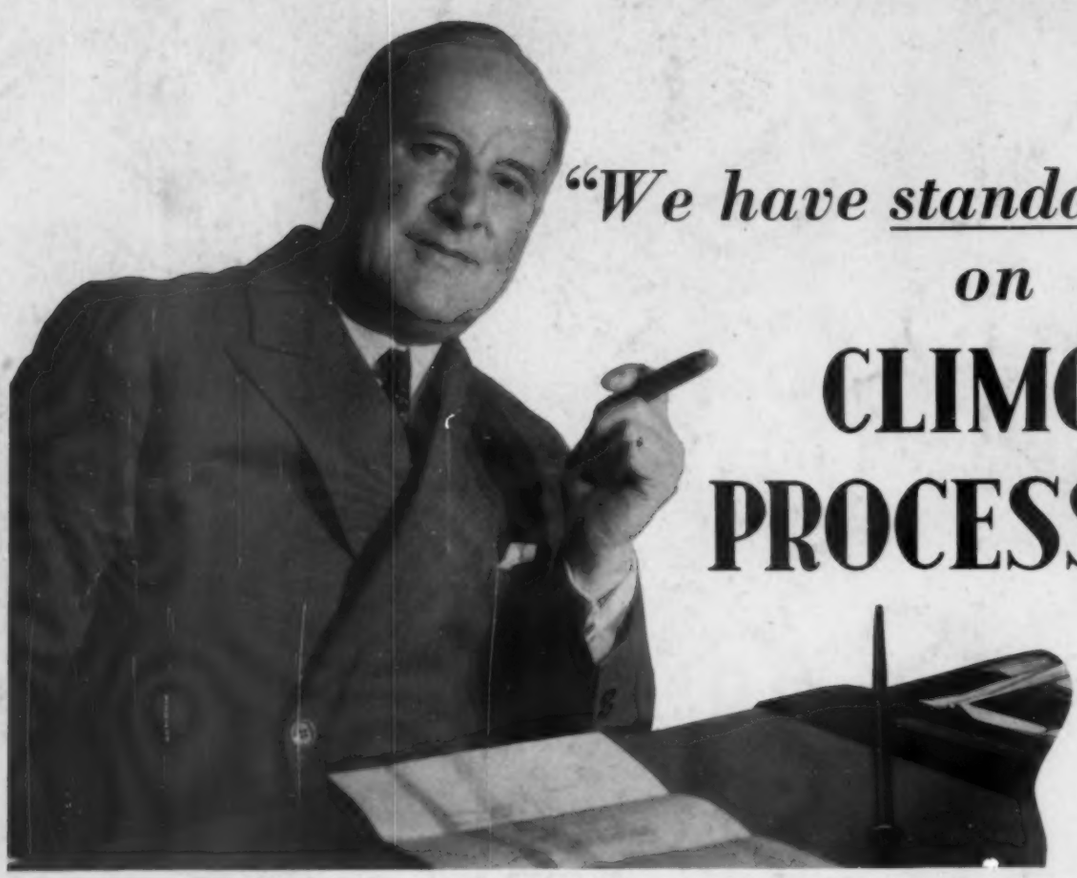

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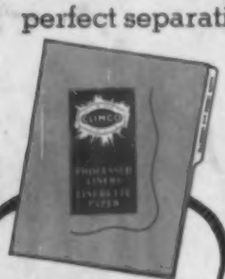

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